

URBAN/MUNICIPAL

CA40N HBL W26

A32

1992

AGENDA OF THE DEVELOPMENT
COMMITTEE OF THE BOARD
OF EDUCATION FOR
THE CITY OF HAMILTON

A G E N D A
DEVELOPMENT COMMITTEE
1992 11 05

URBAN MUNICIPAL
NOV 2 1992
GOV 'MENT DOCUMENTS

Confirmation of the minutes of the regular meeting of 1992 10 01.

G E N E R A L

BUSINESS ARISING OUT OF THE MINUTES:

1. Program Department Strategic Planning
 - (a) Development and Implementation Action Team Report

Pages 1 to 2

NEW BUSINESS:

1. Provincial Benchmarks Project

Page 3
(and separate package)

ELEMENTARY/SECONDARY

BUSINESS ARISING OUT OF THE MINUTES:

1. Program Department Strategic Planning
 - (a) English As a Second Language/English Skills Development Action Team Report

Pages 4 to 20

Education Centre
100 Main Street West
Hamilton, Ontario
1992 11 05

To the Chairman and Members
Development Committee
Hamilton Board of Education

Ladies and Gentlemen:

Re: Development and Implementation Action Team Report

The Directions Paper, March 1991 Program Priorities for the 90's established the following **mandate** for the Development and Implementation Action Team:

The Action Team should review all elements of the present model including:

- Role responsibilities for resource/support staff (system and area teams);
- Line responsibilities (Who reports to whom?);
- Responsibility of resource allocation (How are resources to be assigned?);
- Responsibility of resource deployment (How are resources to be used?).

Accordingly there was to be a two-step process to examine the structure(s) required to connect the process of program* development with program implementation so that the most effective service is delivered to the classroom teacher and the individual student.

*PROGRAM is deemed to mean services and curriculum.

Short Term

The Action Team should review the organizational framework linking program development to program implementation. This will involve an analysis of the structural links between the Program Department, Area Office Resource Teams and School Implementation Plans.

Long Term

Upon the presentation of the recommendations of the other Action Teams, this team would be reconvened to design a new structural and operational model for program development and implementation.

The Development and Implementation Action Team presented its initial draft working paper to Darrel Skidmore, the Superintendent of Program in June 1991 for review. It was determined at that time to study the initial recommendations in relation to the other Action Team reports before proceeding. In the meantime, a variety of other situations have occurred which have affected the original process established for the Development and Implementation Action Team:

- A change in the chairmanship of the Development and Implementation Action Team;
- the development of a program review committee in the fall of 1991 to study program linkages;
- a change of Superintendent of Program in January 1992;
- a moratorium on Action Team work in the spring of 1992;
- budget restraints and accompanying mandates for downsizing and reorganization of program delivery through the Superintendent of Program in 1992;
- a Board approved motion in June 1992:

"That a report on the structure and functioning of the Program Department to include the role of Area Supervisors in relation to the Program Department, be brought to the Board by December, 1992."

- Board approved motions in October 1992 in relation to the Program Accountability Action Team Report:

"That the Program Department, in collaboration with the Area Offices, the schools and the Branch Affiliates:

- i) review current roles and functions of staff in program review, development and implementation, and report to the Board with recommendations by December, 1992;*
- ii) develop a role/function model for effective program review, implementation and delivery in the '90's, together with an implementation plan, and report to the Board by April, 1993.*

After considerable deliberation of the above circumstances and their implications, the Development and Implementation Action Team provides the following recommendations which they feel will assist in meeting the original mandate through communication of Team findings to the Superintendent of Program.

Recommendations

- 1) That the information gathered by the Development and Implementation Action Team be forwarded to the Superintendent of Program for consideration in developing the reports to the Board by December 1992 and April 1993 respectively as outlined in the Board motions.
- 2) That the original chairman of the Development and Implementation Action Team provide input to the Superintendent of Program for consideration in developing the reports to the Board by December 1992 and April 1993 respectively as outlined in the Board motions.

Recommended Action:

That the Development and Implementation Action Team report be received for information.

Prepared by: Development and Implementation Action Team

Submitted by: E. G. Bond
Superintendent of Program

Approved by: K. A. Rielly
Director and Secretary

Education Centre
100 Main Street West
Hamilton, Ontario
1992 11 05

To the Chairman and Members
Development Committee
Hamilton Board of Education

Ladies and Gentlemen:

Re: Provincial Benchmarks Project

The Provincial Benchmarks Project was established in 1991 as part of the commitment of the Ministry of Education to the highest possible achievement in numeracy and literacy for all students.

Provincial Benchmarks for Mathematics in grades 3, 6, 9 have been developed with input from educational and other professional groups that have a specific interest in mathematics.

Provincial Benchmarks in language in grades 3, 6, 9 are currently in the process of being developed.

Ontario's Provincial Benchmarks are education standards "to help assess student achievement and the performance of our school system. Provincial Benchmarks will show what the Ministry of Education expects students to achieve at different stages in their education -- what they should know and be able to do".

Attached is a copy of the Provincial Benchmarks package for grades 3, 6, 9 Mathematics which has just been received from the Ministry of Education. This package will be validated by school boards across the province and returned to the Ministry of Education for review and finalization by the spring of 1993.

Following receipt of the final Ontario Provincial Benchmarks document for Grades 3, 6, 9 Mathematics we shall review and revise our curriculum accordingly to adjust to the standards set out in the Benchmarks document.

Recommendation

That the Ontario Provincial Benchmarks validation package for grades 3, 6, 9 Mathematics be received for information.

Prepared and
Submitted by:

E. G. Bond
Superintendent of Program

Approved by:

K. A. Rielly
Director and Secretary

Provincial Mathematics Benchmarks

Validation/Response Questionnaires

Fall 1992

Provincial Mathematics Benchmarks School Board Response

School Board _____

Address _____

Contact Person _____
(Supervisory Officer)

Telephone _____ Fax _____

Please indicate with a ☒ the groups involved in your school board response and record the number of people from each group in the space beside the box.

Number of People

Students ☐ _____

Parents ☐ _____

Teachers ☐ _____

School Board Administrators ☐ _____

Consultants/Co-ordinators ☐ _____

Trustees ☐ _____

University/College/Faculty of Education ☐ _____

Municipal Government Representatives ☐ _____

Business/Industry ☐ _____

Labour ☐ _____

Special Interest Groups (please specify)

_____ ☐ _____

_____ ☐ _____

_____ ☐ _____

Total number of people who have contributed to this response:

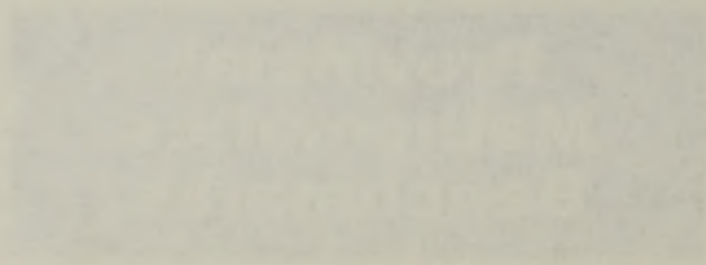
Please return Parts A & B to the Regional Office by January 15, 1993

Provincial Mathematics Benchmarks

PART A

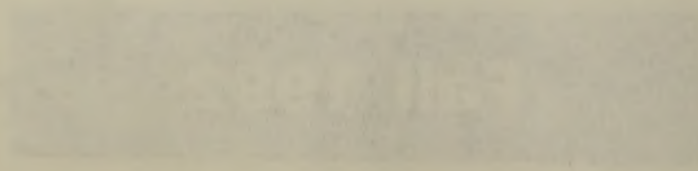
Response to Overall Structure and Components

Fall 1992



PART A

Reference to Chapter
Structure and Organization



Part A: Response to Overall Structure and Components

Please indicate the extent of your agreement by checking the appropriate box for each statement:

1. The framework used for the development of provincial benchmarks is coherent. (See Appendix Ib of document)

strongly disagree	disagree	agree	strongly agree
☐	☐	☐	☐

Comments: _____

2. The components of the provincial benchmarks framework are clearly stated.

a) Critical learning outcomes

☐	☐	☐	☐
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b) Benchmarks

☐	☐	☐	☐
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c) Sample evidence

☐	☐	☐	☐
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d) Sample assessment activities

☐	☐	☐	☐
--------------------------	--------------------------	--------------------------	--------------------------

Comments: _____

3. The three-part structure that identifies achievement for *all*, *most*, and *some* students is realistic.

☐	☐	☐	☐
--------------------------	--------------------------	--------------------------	--------------------------

Comments: _____

4. The sample evidence clarifies the benchmarks statements.

☐	☐	☐	☐
--------------------------	--------------------------	--------------------------	--------------------------

Comments: _____

5. It is appropriate to develop provincial benchmarks for the end of each division (grades 3, 6, 9).

☐	☐	☐	☐
--------------------------	--------------------------	--------------------------	--------------------------

Comments: _____

Part A: Response to Overall Structure and Components (cont'd)

Please indicate the extent of your agreement by checking the appropriate box for each statement:

strongly
disagree

disagree

agree

strongly
agree

6. It is important to develop provincial benchmarks (standards) for grade 12/OAC (graduation).

☐
☐
☐
☐

Comments: _____

7. The provincial mathematics benchmarks, as stated, provide clearly stated standards of achievement for:

a) use by teachers for developing student assessment instruments.

☐
☐
☐
☐

Comments: _____

b) use by school boards developing board-wide assessments.

☐
☐
☐
☐

Comments: _____

c) use by the province for developing provincial assessments.

☐
☐
☐
☐

Comments: _____

d) parents and community to understand what is expected by the end of grades 3, 6, and 9.

☐
☐
☐
☐

Comments: _____

8. Overall assessment of the provincial mathematics benchmarks.

☐
☐
☐
☐

Provincial Mathematics Benchmarks

PART B

Response to Specific Mathematics Benchmarks

Fall 1992

SECRET

PART B

Reference to Specific
Information Enclosed

SECRET

Instructions for Completing Part B of the Questionnaire.

There are three answer sheets, one each for grades 3, 6 and 9. There is one line on the page for each provincial benchmark. Part B is designed to give an overview of the response to the individual provincial benchmarks. Detailed comments, concerns and additions can be written on the document itself or on separate pages. These submissions will be reviewed during January and February when the provincial benchmarks are revised.

Each provincial benchmark is a standard with a three-part structure. The standard states what is expected of all students by the end of grades 3, 6, and 9 and then identifies additional expectations for most and some students. This three-part structure was developed in response to opinions expressed by teachers and community groups, who recommended that the provincial standard of achievement should not be set impossibly high, but neither should a minimum level of achievement be accepted. The three-part structure is intended to accommodate those views.

When responding to the benchmarks in detail, first deal with each benchmark as a complete standard, in a general way. Check in the appropriate box whether you **strongly agree** (it is appropriate the way it is), **agree** (generally agree but there are minor changes that could be made), **disagree** (it needs some change before it is acceptable), or **strongly disagree** (there are major omissions or errors).

To indicate where you want changes in an individual benchmark, use the comments boxes in the right hand column. See the example below.

Example					
	strongly disagree	disagree	agree	strongly agree	
P-1.1	☐	☐	☒	☐	Comments: ☒ 2 ☐ ☐ Other: _____

- If you **generally agree** with Benchmark P-1.1 (Inquiry and Problem Solving), you would check the appropriate box as shown in the example.
- If however, you think that the *all students will* part of the structure is too easy, you would pick out comment two from the codes at the bottom of the page (2. The "*all students will*" part of the benchmarks statement is too easy).
- Other specific comments can be written on the line below.

Instructions for Completing Part 2 of the Questionnaire

There are three types of questions on this page. The first type is a multiple choice question. The second type is a short answer question. The third type is a long answer question. The first type of question is a multiple choice question. It is a question where you are given a list of possible answers and you are to select the one that is correct. The second type of question is a short answer question. It is a question where you are given a question and you are to provide a short answer. The third type of question is a long answer question. It is a question where you are given a question and you are to provide a long answer.

Each question is numbered and is followed by a list of possible answers. The first type of question is a multiple choice question. It is a question where you are given a list of possible answers and you are to select the one that is correct. The second type of question is a short answer question. It is a question where you are given a question and you are to provide a short answer. The third type of question is a long answer question. It is a question where you are given a question and you are to provide a long answer.

When answering the questions, please write your answers in the spaces provided. If you are unsure of the answer, please write "I don't know". If you are unsure of the answer, please write "I don't know". If you are unsure of the answer, please write "I don't know".

To indicate where you want changes to be made, please write in the spaces provided. If you are unsure of the answer, please write "I don't know". If you are unsure of the answer, please write "I don't know". If you are unsure of the answer, please write "I don't know".

Example

Q1. What is the capital of the United States? ☐ New York ☐ Los Angeles ☒ Washington, D.C. ☐ San Francisco	A1. The capital of the United States is Washington, D.C.
--	---

- If you generally agree with Statement 1, please write "Agree" in the space provided.
- If you generally disagree with Statement 1, please write "Disagree" in the space provided.
- If you are unsure of the answer, please write "I don't know" in the space provided.

Part B: Response to Specific Mathematics Benchmarks

Grade 3

Please indicate the extent of your agreement by checking the appropriate box for each statement:

	strongly disagree	disagree	agree	strongly agree
P-1.1	☐	☐	☐	☐

Comments: ☐ ☐ ☐

Other: _____

P-2.1	☐	☐	☐	☐
-------	--------------------------	--------------------------	--------------------------	--------------------------

Comments: ☐ ☐ ☐

Other: _____

P-2.2	☐	☐	☐	☐
-------	--------------------------	--------------------------	--------------------------	--------------------------

Comments: ☐ ☐ ☐

Other: _____

P-3.1	☐	☐	☐	☐
-------	--------------------------	--------------------------	--------------------------	--------------------------

Comments: ☐ ☐ ☐

Other: _____

P-3.2	☐	☐	☐	☐
-------	--------------------------	--------------------------	--------------------------	--------------------------

Comments: ☐ ☐ ☐

Other: _____

P-4.1	☐	☐	☐	☐
-------	--------------------------	--------------------------	--------------------------	--------------------------

Comments: ☐ ☐ ☐

Other: _____

P-5.1	☐	☐	☐	☐
-------	--------------------------	--------------------------	--------------------------	--------------------------

Comments: ☐ ☐ ☐

Other: _____

P-6.1	☐	☐	☐	☐
-------	--------------------------	--------------------------	--------------------------	--------------------------

Comments: ☐ ☐ ☐

Other: _____

Overall Assessment of Grade 3 provincial mathematics benchmarks.

☐	☐	☐	☐
--------------------------	--------------------------	--------------------------	--------------------------

Comments: _____

Please use the following codes for comments, if applicable:

① The "all students will" part of the benchmarks statement is too difficult.

② The "all students will" part of the benchmarks statement is too easy.

③ The "most students will" part of the benchmarks statement is too difficult.

④ The "most students will" part of the benchmarks statement is too easy.

⑤ The "some students will" part of the benchmarks statement is too difficult.

⑥ The "some students will" part of the benchmarks statement is too easy.

Part B: Response to Specific Mathematics Benchmarks

Grade 6

Please indicate the extent of your agreement by checking the appropriate box for each statement:

strongly disagree
disagree
agree
strongly agree

J-1.1

☐ ☐ ☐ ☐
Comments: ☐ ☐ ☐

Other: _____

J-2.1

☐ ☐ ☐ ☐
Comments: ☐ ☐ ☐

Other: _____

J-2.2

☐ ☐ ☐ ☐
Comments: ☐ ☐ ☐

Other: _____

J-3.1

☐ ☐ ☐ ☐
Comments: ☐ ☐ ☐

Other: _____

J-3.2

☐ ☐ ☐ ☐
Comments: ☐ ☐ ☐

Other: _____

J-4.1

☐ ☐ ☐ ☐
Comments: ☐ ☐ ☐

Other: _____

J-5.1

☐ ☐ ☐ ☐
Comments: ☐ ☐ ☐

Other: _____

J-6.1

☐ ☐ ☐ ☐
Comments: ☐ ☐ ☐

Other: _____

Overall Assessment of Grade 6 provincial mathematics benchmarks.

☐ ☐ ☐ ☐

Comments: _____

Please use the following codes for comments, if applicable:

- ① The "all students will" part of the benchmarks statement is too difficult.
- ② The "all students will" part of the benchmarks statement is too easy.
- ③ The "most students will" part of the benchmarks statement is too difficult.

- ④ The "most students will" part of the benchmarks statement is too easy.
- ⑤ The "some students will" part of the benchmarks statement is too difficult.
- ⑥ The "some students will" part of the benchmarks statement is too easy.

Part B: Response to Specific Mathematics Benchmarks

Grade 9

Please indicate the extent of your agreement by checking the appropriate box for each statement:

	strongly disagree	disagree	agree	strongly agree
T-1.1	☐	☐	☐	☐

Comments: ☐ ☐ ☐

Other: _____

T-2.1	☐	☐	☐	☐
-------	--------------------------	--------------------------	--------------------------	--------------------------

Comments: ☐ ☐ ☐

Other: _____

T-2.2	☐	☐	☐	☐
-------	--------------------------	--------------------------	--------------------------	--------------------------

Comments: ☐ ☐ ☐

Other: _____

T-3.1	☐	☐	☐	☐
-------	--------------------------	--------------------------	--------------------------	--------------------------

Comments: ☐ ☐ ☐

Other: _____

T-3.2	☐	☐	☐	☐
-------	--------------------------	--------------------------	--------------------------	--------------------------

Comments: ☐ ☐ ☐

Other: _____

T-4.1	☐	☐	☐	☐
-------	--------------------------	--------------------------	--------------------------	--------------------------

Comments: ☐ ☐ ☐

Other: _____

T-4.2	☐	☐	☐	☐
-------	--------------------------	--------------------------	--------------------------	--------------------------

Comments: ☐ ☐ ☐

Other: _____

T-5.1	☐	☐	☐	☐
-------	--------------------------	--------------------------	--------------------------	--------------------------

Comments: ☐ ☐ ☐

Other: _____

T-5.2	☐	☐	☐	☐
-------	--------------------------	--------------------------	--------------------------	--------------------------

Comments: ☐ ☐ ☐

Other: _____

T-6.1	☐	☐	☐	☐
-------	--------------------------	--------------------------	--------------------------	--------------------------

Comments: ☐ ☐ ☐

Other: _____

Overall Assessment of Grade 9 provincial mathematics benchmarks.

☐	☐	☐	☐
--------------------------	--------------------------	--------------------------	--------------------------

Comments: _____

Please use the following codes for comments, if applicable:

- | | |
|---|---|
| ① The "all students will" part of the benchmarks statement is too difficult. | ④ The "most students will" part of the benchmarks statement is too easy. |
| ② The "all students will" part of the benchmarks statement is too easy. | ⑤ The "some students will" part of the benchmarks statement is too difficult. |
| ③ The "most students will" part of the benchmarks statement is too difficult. | ⑥ The "some students will" part of the benchmarks statement is too easy. |

Provincial Mathematics Benchmarks

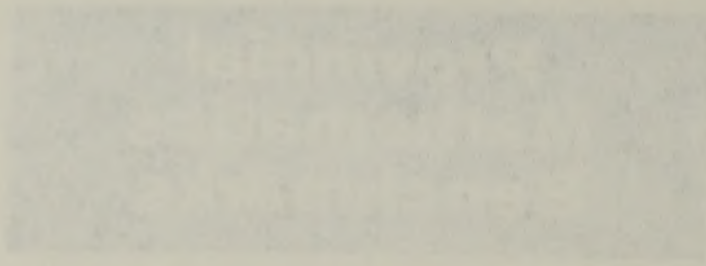
PART C

Suggestions for Improvement (Optional)

These submissions may be made on the Benchmarks document itself or on separate sheets.

- Encourage creative responses from individuals.
- Send in all material collected.
- Write directly in the refine statements, delete, add.
- Add sample evidence.
- Submit examples of model assessment activities.
- Submit samples of board level benchmarks.
- Submit samples of student tracking systems related to outcomes and benchmarks.

Fall 1992

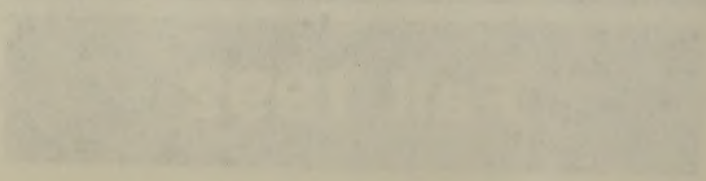


PART C

Suggestions for Improvement (Optional)

These suggestions may be made on the back of the document or on separate sheets.

- Encourage greater participation by individuals.
- Send in all material enclosed.
- Write clearly in the space provided, please.
- Add separate enclosure.
- Please specify if you are enclosing anything.
- Submit suggestions of how to improve the service.
- Submit suggestions of general nature or related to customer service.



Education Centre
100 Main Street West
Hamilton, Ontario
1992 11 05

To the Chairman and Members
Development Committee
Hamilton Board of Education

Ladies and Gentlemen:

Re: English As a Second Language/English Skills Development Action Team

During the 1991 Spring Term, a review of the ESL/D Program was conducted. The Committee reviewed current literature and research including the board's policy "Towards Race Relations and Ethnocultural Equity" and the previous review "Charting a New Course: Education for a Multicultural Society". It examined present practices within our Board and compared current delivery models with three adjacent boards.

The Committee provided several opportunities for interested individuals and/or groups to make written and oral presentations. Grant structures were examined to determine more efficient ways to report and obtain funding for the program.

The following report presents recommendations in four key areas Reception and Orientation, Staffing, Program Delivery and Staff Development.

Recommendation

That the ESL/D Action Team report be approved.

Prepared by:	ESL/D Action Team
Submitted by:	E. G. Bond Superintendent of Program
Approved by:	K. A. Rielly Director and Secretary

Education Committee
1000 North 1st Street
Phoenix, Arizona
85004

To the Chairman and Members
Education Committee
Arizona State Board of Education

Dear Mr. Chairman:

Re: Letter to the Arizona State Board of Education

During the last Spring I was a member of the EST-10 Study Group. The Committee was charged with the task of reviewing the state's educational system and recommending changes. The group was composed of representatives from the State Board of Education, the State Department of Education, and the State Office of Education. The group's findings and recommendations are contained in the report titled "EST-10 Study Group Report" which is being submitted to the State Board of Education.

The Committee believes that the report contains many valuable recommendations for improving the state's educational system. It is our hope that the State Board of Education will accept these recommendations and take the necessary steps to implement them. We believe that these changes are essential for the future of Arizona's education system.

The following report contains recommendations for four key areas: curriculum, teacher education, student assessment, and school improvement. We believe that these recommendations are essential for the future of Arizona's education system.

Sincerely,
[Signature]

That the EST-10 Study Group be expanded

Respectfully,
[Signature]

EST-10 Study Group
1000 North 1st Street
Phoenix, Arizona
85004

Approved by:
[Signature]
Chairman and Members

E.S.L./E.S.O. Working Paper Executive Summary

English As A Second Language / English Skills Development Action Team

Executive Summary



**THE BOARD OF EDUCATION
FOR THE CITY OF HAMILTON**

October 26, 1992

English As A Second Language

English Skills Development

Action Plan

Executive Summary

E.S.L./E.S.D. WORKING PAPER

EXECUTIVE SUMMARY

The E.S.L./E.S.D. program for students from non-English speaking backgrounds or English speaking backgrounds with limited education has existed since 1967. Initially seen as a program for students in only a few schools of the Hamilton Board of Education, E.S.L./E.S.D. students are found all over the system, although most who need this program now live in the lower city. Apart from responding to increasing numbers, the program has also been challenged by students with diverse needs, including literacy in their first language.

Due to these increased numbers there is a need to strengthen the E.S.L./E.S.D. program. The team has made recommendations which bring the E.S.L./E.S.D. program in harmony with other programs within the system. Wherever possible, the neighbourhood school is perceived as the proper place for meeting the needs of E.S.L./E.S.D. students, with regards to reception, orientation and program. In light of current research, support to students may need to be extended from our current practice. Recommendations indicate additional funding can be accessed to cover these increased costs. Other recommendations define area and system responsibilities. The program should be reviewed on a continual basis to ensure that it is meeting adequately the needs of the students it is designed to help.

In 1990 the Board of Education for the City of Hamilton adopted the following definition for use in the identification of E.S.L./E.S.D. students.

DEFINITION

A student requiring E.S.L./E.S.D. is recognized as a student whose English language skills are inadequate or who has academic problems because of a limited education background complicated by cultural differences. Specifically, E.S.L./E.S.D. students should include the following categories:

1. Non-English speaking students - Students who have recently come to Ontario from non-English speaking countries or from Canadian backgrounds where English is not predominant. This category may include students who have not acquired literacy skills.
2. Students with a limited education background - Those students who have recently come from English-speaking countries, but whose educational backgrounds make participation in regular school programming difficult and may include students who have not acquired literacy skills.
3. Original people of Canada - Those whose ancestors were the original people of Canada and who live in communities where a Native Language is the first language of communication. This may include students who have not acquired literacy skills.
4. Adult students - Those more than eighteen years of age who have been out of school for a year and who, if they were younger, would qualify under one of the preceding categories. This may include students who have not acquired literacy skills.
5. International Visa Students - Students, mainly from Hong Kong and the Middle East, who pay tuition fees to attend school in Canada and who intend to fulfill the requirements for university entrance.

Recommendation #1

E.S.L./E.S.D. students should continue to be provided with intensive, partial and tutorial support for a monitored period of up to seven years after the student's registration with the Hamilton Board of Education

Timeline:

Ongoing

Recommendation #2

All E.S.L./E.S.D. students, elementary or secondary school should be served in their neighbourhood school and appropriate resources allocated to meet student needs.

Timeline:

Ongoing

Recommendation #3

Each school will identify an E.S.L./E.S.D. Team who will be responsible for a variety of functions.

Timeline:

Phased in over 92-95 school years.

Recommendation #4

Where necessary in each Area an Area Committee be established.

Timeline:

Plans for Area Committees should be in place during the 1992 - 1995 school years.

Recommendation #5

The Superintendent of Program should review the responsibility for the E.S.L./E.S.D. Program.

Timeline:

By April, 1993.

Recommendation #6

A plan must be put into place for the inservice and professional development of all staff providing service to E.S.L./E.S.D. students.

Timeline:

Ongoing

Recommendation #7

Encourage members of visible minority groups to seek positions with the Hamilton Board of Education.

Timeline:

Ongoing

Recommendation #8

A review of the E.S.L./E.S.D. program in Hamilton should be done on a continuous basis using a review model which ensures accountability.

Timeline:

1994-95 school year.

**English As A Second Language /
English Skills Development
Action Team**

Working Paper

- The Action Team will develop a plan to implement the English As A Second Language / English Skills Development program.
- The Action Team will develop a plan to implement the English As A Second Language / English Skills Development program.
- The Action Team will develop a plan to implement the English As A Second Language / English Skills Development program.



It is the policy of the Board of Education to provide for the education of all children of the City of Hamilton, Ontario, who are of the age of five years or over and who are not yet sixteen years of age.

English As A Second Language Program

English Skills Development

Lesson Plan

Working Paper

The purpose of this program is to provide students with the necessary skills to communicate effectively in English. This includes the development of listening, speaking, reading, and writing skills.

Objectives:
1. To develop listening skills.

The program will be implemented in a series of lessons, each focusing on a specific skill.

It is the policy of the Board of Education to provide for the education of all children of the City of Hamilton, Ontario, who are of the age of five years or over and who are not yet sixteen years of age.

Objectives:
2. To develop speaking skills.



THE BOARD OF EDUCATION
FOR THE CITY OF HAMILTON

INTRODUCTION

The current delivery of E.S.L./E.S.D. programs has evolved in response to demand, but is no longer adequate for present needs.

Firstly, there has been an assumption that E.S.L./E.S.D. is a peripheral concern, limited to a few schools, and outside the mainstream experience. However, this is no longer true. The policies of the Federal Government have increased the numbers of immigrants into Canada. Of these, fifty per cent come to Ontario, and half of these to the Toronto-Hamilton area. The 1986 census indicates that, outside the Metro Toronto area, Hamilton at 21% has the largest percentage of immigrants of any city in Ontario. Students who require E.S.L./E.S.D. programs are present in nearly all schools and this trend will continue. However, orientation and reception procedures are not in place in every school to receive them. There are students who are not receiving program help. This report will address orientation and reception procedures, and appropriate programming.

Secondly, the E.S.L./E.S.D. program was established for students who were assumed to be literate in their first language. However, not only have the numbers of students increased, but their backgrounds are increasingly varied. Now there are students who have spent most of their lives in refugee camps with little or no schooling. The range of programs and resources to meet diverse student needs must be addressed.

Thirdly, E.S.L./E.S.D. program delivery has continued to be seen as a system responsibility since decentralization; the role of schools and Areas in delivering E.S.L. programs has been ambiguous. Questions still unresolved are who should be responsible for staffing, curriculum development and inservice. This report attempts to provide a model of delivery in harmony with other Board developments, with Area and school responsibilities delineated.

Fourthly, research has provided new information about language acquisition and the process of cultural integration. In particular this report has been influenced by research in three areas.

- Students may need up to seven years to acquire English language proficiency.¹
- Students who are valued by the wider Society (and by schools that inevitably tend to reflect that society) succeed to a greater extent than students whose backgrounds are devalued.²
- There is consistently a strong relationship between E.S.L. students' literacy development in their first language and their development of literacy skills in English.³

Recommendations take into consideration this research, to recognize that students may need longer support than was originally envisaged when the E.S.L./E.S.D. program was first started, and that students' cultural background and their acceptance, will have a direct bearing on their academic success.

Finally parents and students indicate that they desire to be educated in neighbourhood schools and want schools to respond to them with sensitivity and tolerance. The principle of the neighbourhood school for the E.S.L./E.S.D. program has been accepted in is report.

¹ J. Eisling, Multicultural Education and Policy O.I.S.E. Press, 1989.

² J. Ogbu, Minority Ed. & Caste, New York: Academic Press, 1978.

³ J. Cummins & M. Swain, Bilingualism in Education: Aspects of Theory Research & Policies. London: Longman, 1986.

BELIEF STATEMENTS

- We believe in education within a home school. All E.S.L./E.S.D. students will eventually be placed in their "home" school where they will receive intensive, partial tutorial or booster program support.
- E.S.L./E.S.D. students are an integral part of the school. The entire school shares in the responsibility for supporting the learning and inter-actional needs of E.S.L. students on a long term basis. The goal for these students is full social and academic integration.
- All aspects of educational opportunity should be made available to students who may require a range of programs and services on a continuous entry basis. Planning for E.S.L./E.S.D. students should be an integral part of each School Plan.
- E.S.L./E.S.D. students, to reach a level of academic proficiency and fluency in English, may require up to 7 years of support.
- The educational and personal experiences that E.S.L./E.S.D. students bring to the school constitute the foundation for all their future learning.
- School staff need to be sensitive to the stages of adjustment for E.S.L./E.S.D. students, with the first two years being the most stressful.
- If E.S.L./E.S.D. students are to catch up academically with their mature English speaking peers, their cognitive growth and mastery of academic content must continue while English is being learned. The teaching of E.S.L./E.S.D. should be integrated with the teaching of other academic content that is appropriate to the student's cognitive level. All content teachers are also teachers of language.¹
- A genuine partnership, established between the school and community, encourages the integration and adjustment of E.S.L./E.S.D. students.
- Schools must be prepared to make a long-term commitment to support the academic and social development of E.S.L./E.S.D. students.

1 Report of the External Review Team on the Vancouver School Board's E.S.L. programs, Vancouver, B.C., 1989
P.11

Recommendation #1

E.S.L./E.S.D. students should continue to be provided with intensive, partial and tutorial support for a monitored period of up to seven years after the student's registration with the Hamilton Board of Education

Timeline:

Ongoing

Cost Implication

Within existing resources; language instructional grants are available through the Ministry of Education.

Rationale:

Current research indicates that a period of up to seven years may be required for full acquisition of the English language and is supported by Ministry guidelines.

Implications:

- A glossary of terms will be developed from the definition to be used by all schools based on research in the field.
- Students will require varied amounts of time in the program under a variety of types of support but may require monitoring for up to seven years. This will require tracking of individual students over the timeline. Computer Services will be requested to update this information on an annual basis.
- The pupil/teacher ratio needs to be reviewed and a formula devised.
- Where there is a need for a student to be assessed by Departments of Speech and Language and/or Psychology, the assessment should be made in the child's first language (for at least the first two years where possible).
- Benchmarks will be developed to assist in the assessment of all students and in particular E.S.L./E.S.D. students.
- E.S.L./E.S.D. programs for adults must be considered as part of any plan for Adult and Continuing Education in Hamilton.

Recommendation #2

All E.S.L./E.S.D. students, elementary or secondary school should be served in their neighbourhood school and appropriate resources allocated to meet student needs.

Timeline:

Ongoing

Cost Implications:

- Saves on transportation
- Within existing resources

Rationale:

Adjustment to the school and community is facilitated when students are included in a school family. Parents indicate problems with their children moving from school to school and their desire to be part of the home school. The best possible solution is for students to receive services in their neighbourhood school.

Students requiring intensive or partial service may be required to receive this service in a school other than the neighbourhood school.

Implications:

- Providing service in the neighbourhood school will help meet the needs of the E.S.L./E.S.D. students socially and emotionally.
- Neighbourhood schooling will benefit the Board financially by reducing transportation costs that are not covered by Ministry grants.

Recommendation #3

Each school will identify an E.S.L./E.S.D. Team who will be responsible for a variety of functions.

Timeline:

1992 - 1995 school years.

Cost Implications:

- no additional cost
- maintain the allocated budget for interpreters

Rationale:

A school team is necessary to ensure that the individual needs of each E.S.L./E.S.D. student are met appropriately.

Initial impressions are lasting, therefore a warm reception of new students and their families is a vital first step to the educational system. It has become increasingly apparent that the orientation process must adopt a family approach so that from the beginning, parents and students are made to feel welcome and encouraged to work with staff to meet their needs. It is important communication takes place in the first language of the families involved wherever possible.

Information about community groups and agencies are valuable resources to be included in the reception package.

Implications:

The Principal should determine the composition of the E.S.L./E.S.D. team. Members may include the following:

- school secretary
- E.S.L./E.S.D. teacher(s)/ designated staff.
- community representatives.

The school team will:

- facilitate the successful reception of students and family
- provide a service complementary to the existing school support services
- provide ongoing communication with home and school and community
- fully integrate the E.S.L./E.S.D. program delivery into the neighbourhood/home school
- assist with staff development around E.S.L./E.S.D. issues
- monitor the progress of E.S.L./E.S.D. students
- actively recruit volunteers from visible minorities
- utilize the skills of board personnel who are multilingual
- continue to develop in-school objectives for E.S.L./E.S.D. teachers to meet ever changing needs
- use community resources for translation and interpretation
- develop a list of translators and interpreters
- the team will ensure that grade placement for E.S.L./E.S.D. students should be age appropriate and the initial assessment should be informal and made where necessary through a cultural interpreter
- at the secondary school level, time must be spent determining equivalency credits before students can be appropriately placed.

Volunteers are an important resource in a school. Volunteers from visible minority groups can be role models for children and can break down barriers. Often parents are willing to help if requested, but may not be accustomed to coming forward without an invitation. Parents from minority groups should be encouraged to volunteer and to learn more about the school and the community to facilitate their cross cultural understanding.

Recommendation #4

Where necessary in each Area an Area Committee be established.

Timeline:

Plans for Area Committees should be in place during the 1992 -- 1995 school year.

Cost Implications:

Within existing resources.

Rationale:

E.S.L./E.S.D. is an integral part of each Area's responsibilities. The Area Committee will assist in the equal access to all resources (Human and Material), communication with parents and community to support the ongoing monitoring of programs for individual students. The needs of the E.S.L./E.S.D. program can be better and more consistently met across the system by developing a network of E.S.L./E.S.D. committees.

Implications:

The Area Committee will consist of resource persons from the Area Team identified by the S.O.S., school teams, community resource people and the person responsible for the E.S.L. program. The makeup of the team will depend on the number of students and the funds available for the program in each area.

The Area Committee will act in an advisory capacity to:

- determine the balance between human and material resources
- assist the school in the placement of students
- monitor the changes in program delivery
- coordinate the use of specialized resources
- connect with community resources
- coordinate the use of Resource Teachers and E.S.L. Program
- be responsible for developing inservice for principals, teachers and all other school personnel
- receive information on the tracking of E.S.L. students

Recommendation #5

The Superintendent of Program should review the responsibility for the E.S.L./E.S.D. Program.

Timeline:

by April 1993

Cost Implications:

nil

Rationale:

Due to the rapid increase and anticipated continuing increase in immigration and the corresponding need for an E.S.L./E.S.D. program there is a need for program coordination and a global focus across the system in order to balance the system expectations for consistency and the schools' local delivery of appropriate service.

Implications:

A review of the need for coordination should include information about the following:

- the demands of continuous enrolment.
- provision for liaison with:
 - i) Area Committee
 - ii) Community Groups
 - iii) Government Agencies (Immigration)
 - iv) Schools
 - v) Other Boards
 - vi) Ministry of Education
 - vii) Adult Education
 - viii) Community Colleges and Universities
- involvement in development, implementation and review of Board curriculum which meets Ministry of Education guidelines and student needs
- the role of assisting Staff Development to inservice all Board personnel who interact with E.S.L./E.S.D. students
- the role of advocate/ombudsman/ambassador for students and program
- establishing and maintaining a tracking process according to the definition and program models
- monitoring and reviewing of program
- establish necessary budgets and resource use as pertains to E.S.L./E.S.D. programs

Recommendation #6

A plan must be put into place for the inservice and professional development of all staff providing service to E.S.L./E.S.D. students.

Timeline:

Ongoing

Cost Implications:

Incorporated in current staff development, area and school E.S.L. budget.

Rationale:

The E.S.L./E.S.D. program is one that will eventually impact on all Board personnel. Continuous inservice will be necessary to meet the needs of various staff in helping them to develop program with an understanding of student, community and family needs within the diverse cultural milieu of our society.

Implications:

Inservice will:

- provide knowledge and skills re: culture, conflict management, multi-cultural and anti-racist education, grieving process, etc.
- involve assessment as an important component of inservice for E.S.L./E.S.D. staff done in consultation with the Psychology department
- conduct needs surveys to address needs
- tailor Part 1,2,3 of E.S.L./E.S.D. credit courses to specific school needs
- focus on P.D. days - invite other school staff to join where appropriate
- develop E.S.L./E.S.D. support groups: team approach with Primary, Junior, Intermediate, Senior divisions teachers and staff
- involve Home and School associations as well as community members
- provide inservice of E.S.L./E.S.D. elementary, secondary and adult staff re: philosophy of program, language acquisition and exemplary practices
- provide staff development regarding the E.S.L./E.S.D. program to lunchroom, secretarial, educational assistant and custodial staff, secondary school cafeteria staff, and regular classroom teachers
- provide training for taxi drivers and bus drivers to assist them to be more sensitive to E.S.L./E.S.D. children's needs
- provide information/inservice to parent volunteers, Home and School members, crossing guards, and interested community members.

The Board should actively encourage all community colleges, offering certificate program for educational assistants, and universities offering pre-service teacher training, to include a multicultural E.S.L./E.S.D. component in their programs.

Recommendation #7

Encourage members of visible minority groups to seek positions with the Hamilton Board of Education.

Timeline:

Ongoing

Cost Implications:**Rationale:**

Research shows there is a strong need for first language speakers in the classroom to assist the learning of E.S.L./E.S.D. students. (ff: Jean Handscombe, North York, 1989). There is a need to build stronger links to the community, to use community resources to provide additional support for reception and orientation, to extend language possibilities, to provide role models in the classroom. Advocates from the community who understand the program can assist in handling complaints and assist with assessment. A more creative use of trained teachers with credentials from other countries can give those teachers experience in Canadian classrooms as well as utilize their talents while they await their Ministry of Education qualifications.

As the nature of the school population changes, this should be reflected in hiring practices. There is also a need for consistent standards and expectations across the system, and a common understanding of the goals and objectives of the E.S.L./E.S.D. program. There is a need for role models across the system. There are job related criteria beyond paper qualifications for any job, encompassing knowledge, skills and attitudes necessary for successful performance of the role.

Implications:

Actively recruit Educational Assistants and Teachers for the E.S.L./E.S.D. program from visible minority groups.

Qualifications and criteria for selection of E.S.L./E.S.D. positions should be developed from the role description.

- When applicants are interviewed for positions within the Board, the nature of the Hamilton Board's student population should be made explicit and the applicant's ability and willingness to work effectively within that context be a consideration in hiring.
- When staff are being interviewed for promotion to positions of responsibility, the applicant's record of working effectively with the multilingual/multicultural/multiracial/multi-religious population of the Board be a consideration.

Recommendation #8

A review of the E.S.L./E.S.D. program in Hamilton should be done on a continuous basis using a review model which ensures accountability.

Timeline:

An initial review should take place in the 1994 - 95 school year.

Cost Implications:**Rationale:**

To ensure the continuation of a dynamic E.S.L./E.S.D. program that is philosophically, fiscally and pedagogically responsible requires an evaluation model.

Implications:

The model needs to include tracking students through their school career in terms of the levels of difficulty attempted and their success with them. The review should be part of the annual E.S.L. report with an extensive review to take place every three years. It should include a survey of teachers, students, parents and community groups and the criteria for the review should be the responsibility of the Area Committees and the person responsible for E.S.L./E.S.D. Program.

MINISTRY OF EDUCATION

VALIDATION DRAFT

September, 1992

ONTARIO PROVINCIAL MATHEMATICS BENCHMARKS

Formative Years (end of Grade 3)

Formative Years (end of Grade 6)

Transition Years (end of Grade 9)

Foreword

The purpose of this document is to assist in the development of public standards for mathematics. In turn, those standards will be used to identify areas where instruction can be improved, to diagnose shortcomings, to determine necessary improvements, and to provide means for the enrichment and enhancement of mathematics programs in English and French language schools across the province.

The document is a draft of the proposed provincial benchmarks in mathematics for Grades 3, 6, and 9. It contains statements of expected learning outcomes for students of mathematics at various stages of their development.

The document represents the conclusion of the first phase of a process that will result in the adoption of provincial standards of achievement for mathematics. It is the result of close collaboration among mathematics teachers, Ministry of Education officials, and representatives of the three mathematics associations in Ontario; it also incorporates materials from school boards in Ontario and in other jurisdictions and countries. The Ministry of Education is pleased to acknowledge the co-operation and assistance of the teachers, researchers and co-ordinators who have contributed to the development of these standards.

The process, however, is not complete. This document has been developed to provide a basis for discussion in order to refine and validate the standards it contains. It is intended to be copied and circulated as widely as possible during the fall of 1992 for comment and revision. Amended benchmarks will then be prepared for adoption during the spring of 1993.

The material in this document is organized in two ways: by grade and by components of mathematics as defined by Ontario mathematics educators. These components have been grouped into the following six *strands* in the document:

- inquiry and problem solving
- number sense and numeration
- spatial sense and geometry
- patterning and algebra
- data management and probability
- estimation and measurement

The necessary mathematical knowledge, skills, and attitudes described as "critical learning outcomes" are provided for each of these strands in each of the divisions: Formative Years (Grades 3, 6) and the Transition Years (Grade 9) (see Appendix II).

The critical learning outcomes are followed by the benchmarks, which describe the standards of achievement that are expected. The benchmarks indicate a provincial standard for *all* students, followed by additional achievement for *most* students. A further level of achievement is also described, which *some* students will attain by the end of the grade. This three-part structure was developed in response to opinions expressed by teachers and community groups, who recommended that the provincial standard of achievement should not be set impossibly high, but neither should a minimum level of achievement be accepted. The three-part structure is intended to accommodate those views.

Each of the benchmarks is followed by "sample evidence", which offers details about achievement. The sample evidence is followed by sample activities that may be used to assess achievement as it relates to each benchmark, for each strand.

The appendices contain additional material which may be helpful to educators and community groups as they attempt to assess and improve these materials.

Appendix I contains the definition of "provincial benchmarks" and a guide to using the materials in the package.

Appendix II contains a summary of the "critical learning outcomes" expected, across the six strands and across the grades.

This document does not discuss the methods of instruction to be followed. It is assumed that, throughout the process of instruction and assessment, all learning will take place within a developmental framework; that technology, problem solving, and estimation strategies will be integrated throughout; that students will work with a wide variety of manipulative materials; that they will be helped to identify patterns leading to generalizations and predictions; that teaching strategies will be co-operative, collaborative, and based on activities; that learning tasks will be authentic and integrated; and that conclusions will be justified verbally or in writing.

Comments and suggestions may be sent directly to:

Burle Summers
Director
Ministry of Education
Learning Assessment Branch
18th Floor, Mowat Block
900 Bay Street
Toronto, Ontario M7A 1L2
Tel: (416) 325-2207
Fax: (416) 325-2231

ONTARIO PROVINCIAL MATHEMATICS BENCHMARKS

Formative Years
(end of Grade 3)

Outcome P-1.1

STRAND 1: INQUIRY AND PROBLEM SOLVING

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Demonstrate ability to recognize, create and solve problems by applying thinking and communication skills.	All students will: recognize, create and solve simple problems and explain the process and solution using appropriate materials. In addition, most students will: plan and carry out a design for problem solving including making appropriate selection and use of resources and technologies, come to a conclusion and report on the task in a variety of ways. In addition, some students will: create and solve more complex problems, record mathematically, evaluate what has been done and report results in a variety of ways.	- in their own words, explain a simple problem. - in a directed situation, apply steps in problem-solving in any mathematical strand. - identify reasonable strategies, select one, and apply it to a simple problem. - using their own words, communicate the strategy used and the solution obtained. - using a model, create and solve problems verbally. - demonstrate willingness to explore real-life problems and perseverance in solving them. - - - explain, in their own words, a simple problem given verbally and identify key elements in solving it. - apply problem-solving strategies in any math strand. - identify reasonable strategies, select one, apply it to a simple problem and use another strategy as well. - using conventional language, communicate the strategy used and the solution obtained. - create and solve new problems using previous problems or similar experiences. - determine a number of reasonable results to open-ended problems. - - - using their own words, verbally explain a multi-step problem and identify key elements for its solution. - justify and evaluate the efficiency of the strategies selected. - evaluate the solution obtained. - create more complex problems using previous problems or problems they have discovered in real life. - determine and justify a number of reasonable results to open-ended problems and identify the most efficient strategy. - -

STRAND 1: INQUIRY AND PROBLEM SOLVING

All students: 1. Given a relevant context, the teacher asks the children to dramatize the following: a) Seven birds are on a fence. Seven more join them. How many birds are on the fence now? b) Twelve birds are on the fence. Seven birds fly away. How many birds are on the fence now? %	Most students: 1. Using a geoboard divided in half, and working in pairs, a student creates a shape on one half of the board, and the other student creates the flip image. %	Some Students: 1. Provide students with a large rectangle, square and triangle from the attribute block set. Have them put the figures in order by area and find a way to prove their answer is correct. %
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Outcome P-2.1

STRAND 2: NUMBER SENSE AND NUMERATION

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Demonstrate understanding of our numeration system.	All students will: - understand, create and describe concrete representations of whole numbers and their values; - understand, create and describe concrete representations of simple fractions	- use numbers appropriately in conversation up to 999. - use concrete materials to construct representations of 2- and 3-digit numbers. - given a concrete representation of a 2- or 3-digit number, name the number. - use concrete materials to construct and identify simple proper fractions with denominators of 2, 3, 4. - using concrete materials, convert units, tens and hundreds. - round off numbers to the nearest ten or hundred. - demonstrate conservation of number in a real-life context.
	In addition, most students will: - using semi-concrete and pictorial representations, justify their understanding of number and write numbers symbolically; - recognize positional value of digits; - using semi-concrete and pictorial representations, justify their understanding of simple fractions and write fractions symbolically.	- place up to three 2-digit numbers in order of magnitude. - given a pictorial representation of a 2- and 3-digit number, name and write the number. - given a pictorial representation of simple fractions with denominators of 2, 3, 4, 5 and 10, name and write the fractions.
	In addition, some students will: apply knowledge of the base ten system in comparison of numbers, including simple fractions.	- place up to three 3-digit numbers in order of magnitude and explain the reasoning used. - compare two simple fractions with common denominators and explain the reasoning used. - use concrete materials or representations to illustrate improper fractions.

STRAND 2: NUMBER SENSE AND NUMERATION

Outcome P-2.1

All students:		Most students:		Some Students	
1. The teacher listens to children discussing quantities of baseball cards or marbles, points obtained in a computer game, number of children who come to a party or other event, read out room or street numbers (to 999). Use numbers up to 999 in measurement situations.	%	1. Given relevant situations, relates the number to the quantity of items. a) number of students in the class b) number of windows in the classroom c) number of students with brown hair d) number of books in the reading centre.	%	1. The children write a story that involves ordering three numbers.	%
2. Using a variety of place value materials, the children make the numbers a) 28 b) 155 c) 77 d) 295.	%	2. Using pictorial representations of loonies, dimes and pennies, the children make the amounts: a) 35¢ b) 87¢ c) \$1.15 d) \$2.79	%	2. The children are instructed to teach another student about hundreds, tens and ones.	%
3. Children recognize a pictorial representation of \$1.27.	%	3. The children insert three missing pages in a folder.	%	3. Given single digits on three cards, the children rearrange them to form the greatest number and explain why.	%
4. Given a pile of objects, the children label it with its number (place value picture or real display, money in dollar coins, dimes, pennies).	%	4. The children arrange the heights in centimetres of three children's heights.	%	4. The children play a place value game on the calculator (e.g. "wipeout").	%
5. Children will construct a concrete representation of a fraction such as 2/3 using a wide variety of manipulation materials, e.g. pattern blocks, interlocking cubes.	%				
6. Teacher listens to children discussing simple fractions in relevant context.	%				
7. Given a relevant problem solving context and appropriate material, the teacher asks: a) given 1 apple, show how you would share it with 3 friends. b) Cut the pizza in 2 equal parts. What fraction is each part?	%				

Outcome P-2.2

STRAND 2: NUMBER SENSE AND NUMERATION

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Understand the fundamental operations of addition, subtraction, multiplication and division and their inter-relationships.	All students will: given a real-life context and appropriate resources, demonstrate the fundamental operations accurately.	- demonstrate an understanding of addition and subtraction with concrete materials. - know basic facts without the use of concrete materials or calculators as defined below: Addition: up to 10 + 10 Subtraction: up to 20 - 10 Multiplication: up to 5 x 5. - demonstrate the addition and subtraction of two 2- and 3-digit numbers using concrete materials (with and without regrouping). - demonstrate understanding of multiplication and its relationship to addition using concrete materials. - using concrete materials or representations, demonstrate multiplication and division. - identify the operation required to solve a simple problem.
	In addition, most students will: given a real-life context and appropriate resources, perform the fundamental operations accurately and explain.	- demonstrate the addition and subtraction of 2- and 3-digit numbers using paper and pencil procedures (with and without regrouping). - demonstrate an understanding of division and its relationship to subtraction using concrete materials. - know basic facts, without the use of concrete materials or calculators, as defined below: Division: up to 25 ÷ 5. - identify and use the specific operations of addition and subtraction in a problem solving situation. - create and solve problems using the operations of addition and subtraction. - use the relationship between related operations to verify results.
	In addition, some students will: given a real-life context, perform the fundamental operations accurately without using resources, and explain and demonstrate the computation.	- know basic facts as defined below: Multiplication: up to 10 x 5 Division: up to 50 ÷ 5. - create and solve problems which demonstrate the operations (+, -, x, ÷) in a given situation. - add and subtract two numbers with more than 3 digits (with or without regrouping).

STRAND 2: NUMBER SENSE AND NUMERATION

Outcome P-2.2

All students:		Most students:		Some students:	
1. When taking attendance, the teacher provides materials and poses a problem similar to those below; a) There are 25 children in our class. Eighteen are here. How many children are away? b) There are 25 children in our class. Three are away. How many children are here? c) There are 25 children in our class, and 27 children in the next class. How many children are there altogether?	3. While the children play a number card game, the teacher observes the children as they total their scores. Given a relevant context, the teacher asks the children number facts orally or on paper, then instructs them to say or write the answers.	1. Given a relevant context and appropriate concrete materials, the children solve the expression $12 + 3$.	4. Given a suitable context, the children write a word problem that goes with the expressions: a) $52 + 19$ b) $73 - 48$	1. Given a problem orally or in written form, the children respond orally or in written form to: a) 9×3 b) $40 + 5$	2. Given a suitable context, the children write a word problem that goes with the expression; a) 3×7 b) $16 + 4$
2. Given a relevant problem solving context and appropriate concrete materials, the teacher asks; a) Given 15 pennies, you spend 6. How many pennies are left? b) Given 2 pennies, then 6 pennies, then 4 pennies, how many pennies do you have?	4. Given a relevant situation in the classroom, the teacher provides concrete materials to solve word problems which contain the following expressions: a) $48 + 16$ b) $230 + 175$ c) $65 - 18$ d) $238 - 153$	2. Given a problem orally or in written form, the children respond orally or in written form to: a) 3×4 b) $24 + 4$ <i>NOTE: Teachers are encouraged to observe these responses in the context of a card game.</i>	5. Given a suitable context, the children; a) make up a shopping problem that involves addition and solve it. b) make up a sports problem that involves subtraction and solve it.	3. Given a suitable context, the children; a) make up a shopping problem that involves multiplication and solve it. b) make up a sports problem that involves division and solve it.	3. Given a suitable context, the children; a) make up a shopping problem that involves multiplication and solve it. b) make up a sports problem that involves division and solve it.
5. Given a relevant context, the children can solve 4×5 using concrete materials.	3. Given the context of a class excursion and using a paper-and-pencil procedure, the children can solve word problems similar to the following: a) Some children are going on an excursion. Thirty-eight children get on one bus, and 27 get on the other bus. How many children are going on the excursion? b) There are 45 children on one bus. Eighteen get off. How many children are left on the bus?	3. Given the context of a class excursion and using a paper-and-pencil procedure, the children can solve word problems similar to the following: a) Some children are going on an excursion. Thirty-eight children get on one bus, and 27 get on the other bus. How many children are going on the excursion? b) There are 45 children on one bus. Eighteen get off. How many children are left on the bus?	3. Given the context of a class excursion and using a paper-and-pencil procedure, the children can solve word problems similar to the following: a) Some children are going on an excursion. Thirty-eight children get on one bus, and 27 get on the other bus. How many children are going on the excursion? b) There are 45 children on one bus. Eighteen get off. How many children are left on the bus?	3. Given the context of a class excursion and using a paper-and-pencil procedure, the children can solve word problems similar to the following: a) Some children are going on an excursion. Thirty-eight children get on one bus, and 27 get on the other bus. How many children are going on the excursion? b) There are 45 children on one bus. Eighteen get off. How many children are left on the bus?	3. Given the context of a class excursion and using a paper-and-pencil procedure, the children can solve word problems similar to the following: a) Some children are going on an excursion. Thirty-eight children get on one bus, and 27 get on the other bus. How many children are going on the excursion? b) There are 45 children on one bus. Eighteen get off. How many children are left on the bus?

Outcome P-3.1

STRAND 3: SPATIAL SENSE AND GEOMETRY

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Develop a spatial sense for their own environment, the properties of the objects in it and their interrelationships.	All students will: - recognize and identify properties of objects and describe them in their own words; - be able to identify the motions of slide, flip and turn. In addition, most students will: - identify simple patterns created by slides, flips and/or turns; - use simple motions to create a pattern; - recognize and identify properties of objects and describe them in their own words and compare. In addition, some students will: - identify the combination of movements that take an object from one position to another; - identify and justify patterns in two 3-D objects.	- identify situations in their homes or classrooms which are samples of slides, flips and turns. - show and explain one motion over a plane. - recognize and identify objects within the environment having characteristic shapes (i.e. rectangle, prism). - identify simple patterns created by slides, flips and/or turns. - use slides, flips and turns to create designs. - show and explain three motions over a plane. - compare objects within the environment with similar characteristics. - given the original position and an image of a 2-D object, identify what movement has taken place. - demonstrate motion geometry by using concrete materials (pattern blocks, geoboards) and explain findings in their own words. - identify the combination of slides, flips and turns that created a design, pattern or movement. - demonstrate and explain a combination of more than three motions over a plane. - select three physical objects, identify the basic shape common to all three, and justify why they occur in each. - anticipate the location of the final image of a 2-D object following a combination of more than three motions.

STRAND 3: SPATIAL SENSE AND GEOMETRY

Outcome P-3.1

All students:	Most students:	Some Students:
1. Recalling situations and objects in homes or classrooms, the children will a) name a variety of common everyday examples of slides b) name a variety of common everyday examples of flips c) name a variety of common everyday examples of turns. % 2. Listen to children describe body movement during physical activities. % 3. Given a common object, such as a pair of scissors, the children will identify the motion used to transform the object. %	1. The children demonstrate how slides, flips and/or turns are used in common examples of patterns such as wallpaper, quilts and fabrics. % 2. Given half a face constructed with patterns blocks in an oval, the children will create the other half of the face. %	1. The children describe the combinations of motions used in a transformation toy such as a robot car. a) The children demonstrate and explain how slides, flips and turns are used to create a body movement routine, such as teaching a friend to dance. b) The children write or draw directions for a dance routine. %

Outcome P-3.2

STRAND 3: SPATIAL SENSE AND GEOMETRY

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Demonstrate understanding of the attributes of two dimensional figures and three dimensional shapes and their properties as they move in space.	All students will: identify and describe properties of objects using their own language, within their own experience and using concrete resources.	- identify 2- and 3-D shapes from the environment and from pictures using their own language. - build structures using junk materials. - name circle, square, rectangle and triangle. - make a picture using 2-D geometric shapes. - sort natural objects according to their own geometric criteria. - identify corners, edges and faces on a cube and rectangular prism.
	In addition, most students will: identify and describe properties of objects and justify their reasoning, within the child's experience and using concrete resources.	- name pentagon, hexagon, and octagon. - provide specific details about a shape or solid. - construct skeletal models or paper shell models of solids. - construct frames or outlines of shapes. - identify vertices, edges and faces on a variety of everyday objects that reflect standard geometric solids and shapes. - justify verbally whether two shapes are similar and/or the same size.
	In addition, some students will: identify and describe properties of objects using correct terminology, justify their reasoning and be able to make comparisons with other objects. Notes: objects are 2-D and 3-D	- name trapezoid and rhombus. - use correct geometric terminology to identify and describe a collection of objects (cube, cone, cylinder, sphere, rectangular prism, triangular prism, triangular-based pyramid, square-based pyramid) and shapes (square, circle, triangle, rectangle, pentagon, hexagon, octagon). - compare two objects for similarities and differences.

STRAND 3: SPATIAL SENSE AND GEOMETRY

Outcome P-3.2

All students:	Most students:	Some students:
1. Using their own language, the children describe geometric solids and shapes in the school environment, while on a neighbourhood walk, or at home in the toy box. % 2. The children describe geometric components in a structure (future cities, robots, castles) using their own language. % 3. The children copy a triangle, rectangle and square from dot paper onto a geoboard, and can name them. % 4. Given a collection of shapes, the children can select a named shape. % 5. Using their own language, the children describe the geometric components of the picture they have made. % 6. Given a collection of everyday materials, the children sort and classify according to a geometric property. % 7. Given a variety of geometric solids and everyday objects, the children can match a geometric solid with an everyday object. %	1. Given a collection of shapes, the children can select a named shape including pentagon, hexagon, and octagon. % 2. Given a shape or solid, the children give specific details about the object using their own language. % 3. Given suitable materials (e.g. straws and pipe cleaners, toothpicks and marshmallows), the children construct a skeletal model of a standard geometric solid % 4. Given suitable materials (e.g. construction paper, wrapping paper) the children construct a shell model of a standard geometric solid % 5. Given suitable materials (e.g. geo-strips, straws and pipe cleaners), the children construct various outlines of common geometric shapes, examining similarities and differences %	1. Given a collection of shapes (e.g. pattern blocks), the children can select a named shape including trapezoid and rhombus. % 2. Given a list of geometric terms, the children go on a scavenger hunt for the shapes or solids. % 3. Given a solid, the children can identify the location and number of corners, edges and faces. % 4. Given 2 objects, the child is able to name them and compare their differences and similarities in geometric terms. %

Outcome P-4.1

STRAND 4: PATTERNING AND ALGEBRA

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Recognize, describe and generalize patterns to build mathematical models and to solve everyday problems.	All students will: identify, copy and extend simple patterns in numbers, geometry and measurement using appropriate resources.	- skip count by 2s up to 100 starting from 2, and by 10s up to 100 starting from 10. - recognize, describe, extend and create a wide variety of repeating patterns. - represent and describe mathematical relationships -- e.g., odd and even numbers. - predict the next term in a simple pattern. - count by steps and express this as repeating additions. - using a calculator, produce a sequence from the addition or multiplication of a constant, and note the results. - using concrete materials or simple representations, determine the missing term in a simple equation and in equations demonstrating commutativity and associativity. - using concrete materials or simple representations, construct families of equivalent operations for addition and subtraction.
	In addition, most students will: • represent and justify more complex patterns using objects, illustrations and symbols; • begin to recognize patterns in number systems.	- skip count by 5s up to 100 starting at 5, and by 3s starting at 3. - create and identify simple patterns on hundreds board such as rows, columns and diagonals. - recognize, describe, extend and create a wide variety of repeating and growing patterns. - identify, complete, augment or create a sequence (using 1 variable), explaining its structure. - construct families of equivalent operations for addition and subtraction. - determine the missing term in a simple equation and in equations demonstrating commutativity and associativity. - explain a simple given algorithm (2 variables and 1 operation) and create a sequence from it.
	In addition, some students will: use patterns as a problem-solving strategy.	- predict the next term in more complex patterns. - skip count by 2s, 3s, 5s and 10s from any starting point. - create complex repeated and growing patterns. - use patterns to solve everyday problems. - apply and state a rule or an algorithm of transformations on the elements of a set.

STRAND 4: PATTERNING AND ALGEBRA

All students:	Most Students:	Some Students:
1. Students are given a variety of concrete materials with which to match, create and extend patterns. △ □ △ □ □ ... 2357 2357 ... % 2. Given a set number of cards with even numbers between 2 - 20 the children put the cards in the correct order. %	1. On a hundreds chart children are asked to skip count by 5s and recognize an existing pattern. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 ... % 2. Using concrete materials build patterns to represent both odd and even numbers. % 3. Using pattern blocks children will create a growing symmetrical pattern. %	1. Given a hundreds charts: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 ... 3 + 14 = 17 13 + 4 = 17 Children are asked to discover patterns within the sample cross-pattern and find another cross-addition pattern on the hundreds chart. %

Outcome P-5.1

STRAND 5: DATA MANAGEMENT AND PROBABILITY

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Collect, organize, display and interpret data and investigate the concepts of chance and probability.	All students will: collect, organize and display information in a variety of ways to form reasonable interpretations. In addition, most students will: • formulate and solve problems by collecting, organizing, displaying and interpreting relevant information; • use this data to predict the probability of an event occurring. In addition, some students will: predict the probability of an event occurring within an everyday situation and provide reasonable data.	- construct a concrete graph based upon data collected using a scale of 1:1 - complete a partially constructed bar graph or pictograph using a scale of 1:1. - organize materials according to specific criteria - shape, colour, and display information in a chart form. - answer specific questions about a bar graph or pictograph: - what colour of jelly beans was the most common?, least common? - - - - - conduct a survey or interview to gather data. - construct a pictograph or bar graph from collected data using 1:1 scale. - draw conclusions from data and translate tally or chart to bar graph. - independently construct pictographs and bar graphs using multiple scales, 2, 5, 10. - create a relevant question to be solved. - make reasonable predictions about family events and situations based on observation within their experiences. - use data from within common experience to make reasonable predictions. - - - - - make reasonable predictions based on specific data presented in the form of graphs, pictures or charts.

STRAND 5: DATA MANAGEMENT AND PROBABILITY

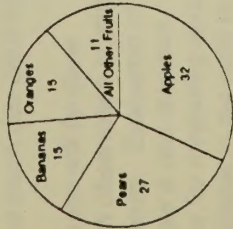
All students:

1. The teacher will observe children create concrete graphs based on relevant data from the classroom.
e.g. types of shoes

%

2.

FRUITS LIKED MOST
BY CHILDREN IN A GROUP



According to the chart, which fruit is liked best by the greatest number of children?

- A) Pears
B) Apples
C) Bananas
D) Oranges

%

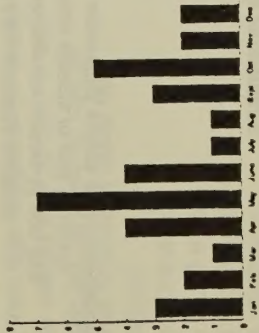
3. Students will answer oral questions re: concrete graphs and pictographs.

- a) How many smarties are red? blue?
b) What colour is found the most?

%

4. Gather information from your classmates about their favourite TV show. Place the information on a chart.

BIRTHDAY CHART FOR NEWTON IN 1992



- a) In which month were the greatest number of children in Newtown born?

- A) March
B) April
C) May
D) October

- b) In which month were the same number of children born as were born in April?

- A) January
B) June
C) September
D) October

%

Most Students

1. The teacher observes children working collaboratively to formulate and solve problems:

- a) Conduct a survey re the different types of pets owned by members of our class.
b) Display results using a bar graph or pictograph.
c) Draw conclusions.

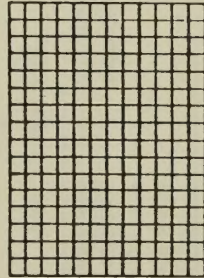
%

2. Four children separately collect and tally results of four friends' favourite fruit. Collaboratively they create a pictograph to represent the total results.

%

3. Make a bar graph using the information below:

(1 square for each bar)



- ② . 8
① . 2
③ . 4
④ . 1
⑤ . 7

%

4. Reforestation in Canada's Parks

Gatineau	▲▲▲▲▲▲▲▲▲▲
Kicking Horse	▲▲▲
Champlain	▲▲▲▲▲▲▲▲▲▲
Algonquin	▲▲▲▲▲▲▲▲▲▲
Banff	▲▲▲▲
Black Creek	▲▲▲▲
Each ▲ represents 50 trees	

How many trees were planted in Champlain Park?

- A) 200
B) 150
C) 500
D) 125

%

Some students:

1. Using a scale of:

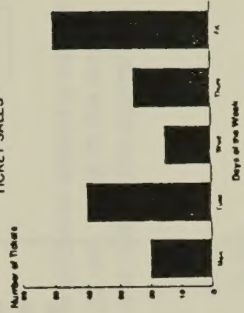
- a) Children are asked to discover how many (red, blue, white) cars are in the school parking lot.

- b) Children are asked to display results on a pictograph or bar graph.

%

2.

TICKET SALES

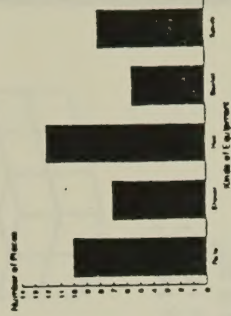


The figure above shows the number of tickets sold on each of five days. On which day were 26 tickets sold?

- A) Monday
B) Tuesday
C) Wednesday
D) Thursday

%

3. On a visit to a farm, Mrs. Zen's class made a graph to show the number of pieces of each type of garden equipment.



- a) How many rakes were there?
b) How many baskets?
c) How many more spades than baskets?
d) 10 children wanted to use hoes. How many hoes were left over?
e) Which garden tool had the biggest number?

%

Outcome P-6.1

STRAND 6: ESTIMATION AND MEASUREMENT

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Demonstrate temperature, time, distance, area, capacity/volume, mass and money, and where applicable, estimate, measure and interrelate them.	All students will: select an appropriate unit to estimate and measure a chosen attribute.	- relate temperatures to real life experiences. - recognize that a thermometer indicates temperature. - use various devices to illustrate a beginning and an ending of an interval of time. - read time to the quarter hour using an analog clock. - demonstrate an understanding of a calendar as a visual representation of time and to determine and record dates of a certain event. - estimate, measure and record distance to the nearest metre and centimetre. - determine the surface area by counting squares. - compare the capacity of various containers to one litre. - compare the mass of various objects to one kilogram. - recognize coins and their equivalent values and interrelationships. - count coins to one dollar.
	In addition, most students will: select a suitable standard unit and measuring device to estimate and measure attributes with an appropriate degree of accuracy and experiment with conversions.	- use a thermometer to take temperature. - relate temperature to seasonal conditions. - measure intervals of time using both standard and non-standard devices. - read and record time to a five minute interval using an analog clock. - choose an approximate unit of measure to determine area in a problem solving situation. - determine the surface area of both regular and irregular shapes by counting squares. - estimate, measure and record capacity to the nearest litre. - estimate, measure and record mass to the nearest kilogram. - recognize coins and notes and their equivalent value and interrelationship. - count coins and bills to five dollars.
	In addition, some students will: make effective use of a personal set of reference points that link non-standard to standard units to estimate and measure.	- use a thermometer to take temperature with accuracy - measure intervals of time using an appropriate unit - read and record time to a one minute interval on an analog clock - use a calendar to organize events and manage time - demonstrate the relationship between a metre and a centimetre - create measurement problems choosing appropriate units when measuring area - shown one square unit, draw a shape having a specific number of square units - use amounts of money up to \$5.00 in meaningful ways and provide correct change

STRAND 6: ESTIMATION AND MEASUREMENT

Outcome P-6.1

All students:

1. Using an empty cereal box, students are asked to describe and measure the attributes of the box:
- a) How tall it is?
 - b) How large is it?
 - c) How large is the front?
 - d) Fill the box with rice.
 - e) How much is its mass?
 - f) How much rice did it hold?

Evaluation will be done through observation of student behaviours. Evaluation of standard & non standard devices for measuring should be available to the child to choose from.

2. Estimate the length of the classroom in metres. The teacher should observe and record the degree of accuracy and the strategy used to estimate.

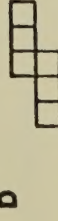
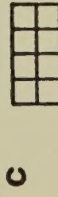
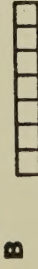
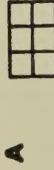
3. Make up a calendar for a winter month and record 3 important events.

4. Sort several containers into two groups < litre, > litre. Find a method to show that your estimates were correct.

5. A train was supposed to leave the station at 9:20 a.m. If the train left 10 minutes late, at what time did it leave the station?

- a) 9:10 a.m.
- b) 9:20 a.m.
- c) 9:30 a.m.
- d) 9:40 a.m.

6. Which of the following figures has the largest area?



Most Students:

1. Using a Saturday morning TV guide schedule, have children identify beginning & ending time of a certain program and the length of the program.

2. Which of the following would have a mass closest to 1 kg. Mark it with an "X".



3. Use your ruler to draw a line segment that is 4 cm long.

4. Using this straw as your unit of measure, estimate the length of the line.



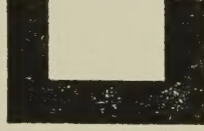
The line is _____ straws long.

5. What time does the clock show?



2. Read the story "Alexander, Who used to be Rich Last Sunday" to the students. Students will be asked to demonstrate using coins, the events in the story.

7. Measure with your ruler to find the perimeter of this shape.



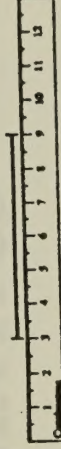
Perimeter = _____

Some Students:

1. Terry left home for school at 8:14 a.m. It took her 17 minutes to get there. What time did she arrive?

_____ %

2. How long is the line segment shown above the ruler?



Answer: _____ cm

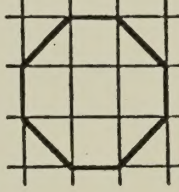
_____ %

3. The distance around a square is 20 cm. What is the length of one side of the square?

- a) 2 cm
- b) 4 cm
- c) 5 cm
- d) 10 cm

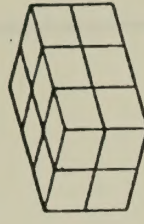
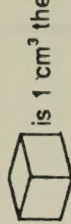
_____ %

6. Find the area in square centimetres.



Area = _____ sq. cm. _____ %

4. If _____ is 1 cm³ then the volume of the figure is:



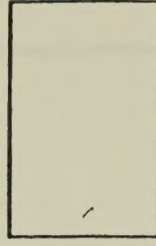
- a) 16 cm³
- b) 11 cm³
- c) 6 cm³
- d) 12 cm³

_____ %

5. _____

24 cm

16 cm



What length of string, in centimetres, is needed to go completely around the rectangle shown above?

Answer: _____

_____ cm

_____ %

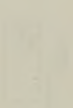
THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION

1923

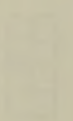
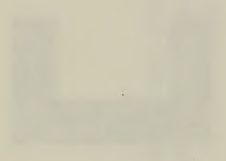
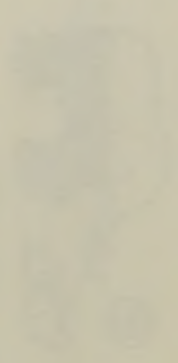
THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION

Volume 26, No. 17, May 15, 1923

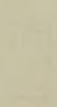
Original Articles



Original Articles



Original Articles



Original Articles

Original Articles

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1923

ONTARIO PROVINCIAL MATHEMATICS BENCHMARKS

Formative Years
(end of Grade 6)

STRAND 1: INQUIRY AND PROBLEM SOLVING

- collaboratively rephrase, organize and suggest solutions using limited strategies.
- independently, solve simple inquiry problems in context, across all the strands of mathematics.
- collaboratively, create a simple inquiry problem using a variety of resources; communicate and their solution and process.
- demonstrate curiosity, flexibility and perseverance.
- demonstrate increasing confidence in solving real-life problems.

given a simple problem in context, rephrase, organize and generate solutions with increasing independence.

using various strategies solve simple inquiry problems across the all strands of mathematics.

solve complex inquiry problems through a variety of strategies in a collaborative manner.

given a complex problem in context, rephrase, organize and generate solutions using numerous strategies to solve complex inquiry problems across all the strands of mathematics.

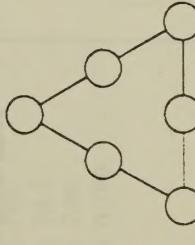
collaboratively, create a complex inquiry problem using a variety of resources.

STRAND 1: INQUIRY AND PROBLEM SOLVING

All Students:

1. Greg, Asim and Krishna are in a race. Asim did not come first. Krishna did not come last. Asim finished ahead of Greg. Who finished the race first, second and third? 79%
2. Four train tickets cost \$68.60. How much does each ticket cost? What would you do to solve this problem?
- | | Walked to School | Rode to School | Driven to School |
|--------|------------------|----------------|------------------|
| Male | 15 | 8 | 3 |
| Female | 11 | 10 | 7 |
3. Alan, Brenda and Carol each had a different breakfast. One had hot cereal, one had cold cereal and one had only a glass of milk. Carol did not have cold cereal or the milk. Brenda did not have cold cereal. What did Allan have for breakfast? 75%
4. At the school bake sale one class sold 8 trays of brownies at \$3.00 per tray, and 4 trays of cookies at \$2.00 per tray. How much money did the class make altogether? 77.7%
5. Mary has 64 hockey cards. She gives three-quarters of the cards to Frank. How many cards did she give to Frank?
- A) 16
B) 38
C) 48
D) 44

Most Students:

1. Place each of the numbers 1, 2, 3, 4, 5 and 6 in the circles so that the sum of numbers on each side of the triangle is the same. Use each number only once.
- 
3. Halton Street Public School went on a school trip to Kelso Conservation Area. There were 356 students. Each bus held 65 students. How much would it cost to rent the buses if each bus cost \$125?
- A) \$575
B) \$750
C) 5R 38
D) \$125
4. Father purchased 3 kg of ground beef at \$4.25 a kilogram. What operation would you use to find the total cost of the ground beef in this problem?
- A) Add
B) Subtract
C) Multiply
D) Divide
5. Brad baked 720 cookies. How many boxes would he need if he packed 12 cookies in each? 69%
6. Factory workers make 120 clocks per day. If two clocks are broken during each day's production, how many working clocks are produced in 6 days?
- A) 608
B) 712
C) 708
D) 718

Some Students:

1. You have 12 coins totalling \$1.65. If your coins are dimes and quarters, how many dimes do you have? 30%
2. Four students came to a meeting. If each one shook hands with everyone else once, how many handshakes would there be altogether? 21%
3. A soccer team earns 2 points for a win and 1 point for a tie. The team won twice as many games as it tied and lost no games. If the team scored a total of 15 points, how many games did it play? 16%
4. I gave my brother half of my Candies. I then gave my sister half of what I had left. Then I ate eight and had 7 left. How many did I start with? Show your work. %
5. The following amounts of minerals and vitamins are contained in 30 g of a cereal.
- | | | |
|-------------|-------|-------|
| Calcium | | 1 mg |
| Phosphorous | | 14 mg |
| Iron | | 4 mg |
| Magnesium | | 2 mg |
- How many milligrams of iron are there in a box containing 60 g of cereal?
- A) 2
B) 240
C) 12
D) 8
6. Jennifer, Leon and Abe all work at Chicken Delight. The restaurant is open 7 days a week. Jennifer works every day, Leon works every second day, and Abe works every third day. They all work together on Monday. When is the next day they all work together?
- A) Wednesday
B) Thursday
C) Friday
D) Saturday
E) Sunday

1. At the school bake sale one class sold 8 trays of brownies at \$3.00 per tray, and 4 trays of cookies at \$2.00 per tray. How much money did the class make altogether? 77.7%
2. Four train tickets cost \$68.60. How much does each ticket cost? What would you do to solve this problem? 75%
3. Alan, Brenda and Carol each had a different breakfast. One had hot cereal, one had cold cereal and one had only a glass of milk. Carol did not have cold cereal or the milk. Brenda did not have cold cereal. What did Allan have for breakfast? 71.1%
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6. Factory workers make 120 clocks per day. If two clocks are broken during each day's production, how many working clocks are produced in 6 days?
- A) 608
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D) 718
7. Which number between 30 and 50 is both even and a multiple of 7?
- A) 30
B) 35
C) 42
D) 49
E) 50
8. At the school bake sale one class sold 8 trays of brownies at \$3.00 per tray, and 4 trays of cookies at \$2.00 per tray. How much money did the class make altogether? 77.7%
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- A) Add
B) Subtract
C) Multiply
D) Divide

Outcome J-2.1

STRAND 2: NUMBER SENSE AND NUMERATION

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Identify and understand whole number place values, decimal place values and demonstrate an ability to estimate, read and write numbers.	All students will: • read, write, and express numbers in a variety of forms, and justify their response; • begin to demonstrate an understanding of numbers within a contextual framework; • use whole numbers, fractions and decimals in real world context.	- recognize relative magnitude of numbers. - use decimals, fractions and whole numbers, when and where appropriate. - know when a number is reasonable in an everyday context. - read, write, and express numbers in a variety of forms (words, numbers, drawings and concrete materials). - use whole numbers, (simple proper) fractions and decimals (tenths - hundred thousandths) in a real life context and demonstrate understanding. - place whole numbers in order by magnitude and explain the reasoning used.
	In addition, most students will: • demonstrate recognition and understanding of numbers within a contextual framework; • use estimation skills to make decisions that are common in everyday life. In addition, some students will: • demonstrate an understanding of more complex numbers in a meaningful context.	- use whole numbers, simple, proper fractions and decimals (hundredths - hundred millions) in a real life context, and demonstrate understanding. - place either whole numbers, fractions or decimals in order by magnitude and explain the reasoning used. - place a combination of whole numbers, fractions and decimals in order by magnitude and explain the reasoning used.

STRAND 2: NUMBER SENSE AND NUMERATION

All Students:	Most Students:	Some Students:
1. Which of these represents eight hundred seven and three tenths? A) 807.3 B) 87.3 C) 8073 D) 873 2. What is the most reasonable way to express the cost of a compact disc? A) \$21.05 B) 2105¢ C) \$0.2105 D) 21.05¢ 3. Write in words, the following numbers: a) $\frac{2}{3}$ b) 0.3 c) 1325 d) $4\frac{1}{2}$ 4. Illustrate the following numbers either with manipulative materials or pencil and paper: a) $\frac{1}{2}$ b) 2.3	1. Show how to make 30¢ using 9 coins. 2. Which number has 7 tens, 8 ones and 9 tenths? A) 789 B) 78.9 C) 7.89 D) 0.789 3. The expression $5 + \frac{8}{10} + \frac{4}{100}$ represents: A) 5.48 B) 58.4 C) 5.84 D) 0.584 4. Write a word story (problem) that could be solved by using the following number sentence. $\frac{1}{4} + \frac{1}{2} = \frac{3}{4}$ 5. Round the number 46 718 to the nearest thousand. 6. Rounded to the nearest ten thousand, 33 862 is: A) 30 000 B) 34 000 C) 33 000 D) 40 000 7. Estimate by rounding to the nearest thousand 6934 – 3216. A) 3000 B) 3720 C) 4000 D) 3700	1. What will happen to the fraction $\frac{4}{6}$ if both the numerator and the denominator increase by 5? A) Fraction gets bigger. B) Fraction gets smaller. C) Fraction stays the same. D) Not enough information to tell. 1. Write these numbers in order from smallest to largest. 2.37, $2\frac{3}{4}$, 2.25, $2\frac{1}{2}$.

Outcome J-2.2

STRAND 2: NUMBER SENSE AND NUMERATION

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Select and use an appropriate method of computation from among estimation, mental, paper and pencil, calculator, computers, and/or manipulative materials, and solve a problem accurately that involves computation using whole numbers, fractions and decimals.	All students will: - solve simple non-routine problems; select an appropriate method of computation to solve routine problems and explain the choice; - use estimation to predict possible answers to routine problems.	- explain the relationship between whole numbers and decimals. - know when a solution is reasonable. - identify when to use a specific computation for routine problems. - know their basic number facts for multiplication and division: - up to 10×10 - up to $100 \div 10$. - add and subtract simple decimals and fractions. - explain through a reasonable argument that a solution is correct and that the method of computation was appropriate (ie. computer, calculator, pencil and paper, mental). - use estimation strategies appropriately to solve problems. - illustrate the relationship between (simple proper) fractions and decimals. - solve simple problems using whole numbers, decimals and fractions.
	In addition, most students will: - use estimation to predict possible answers to simple routine and non-routine problems; - select an appropriate method of computation to solve routine and non-routine problems and explain the result; - create and solve routine and non-routine problems.	- identify when to use specific computations for non-routine problems. - create and/or solve routine and non-routine problems using whole numbers, decimals and fractions and explain their solutions. - explain relationships between (simple proper) fractions and decimals.
	In addition, some students will: - use estimation to predict possible answers to more complex routine and non-routine problems; - select an appropriate method of computation for solving complex routine and non-routine problems and justify the result.	- identify when to use specific computations for complex, routine and non-routine problems. - create and/or solve complex, routine and non-routine problems using whole numbers, decimals and fractions and explain their solutions.

STRAND 2: NUMBER SENSE AND NUMERATION

Outcome J-2.2

All Students:

1. $32 \overline{)120} =$
A) 5R14
B) 5R4
C) 4R3
B) 4R1

85%

2. $9654 - 4380 =$
A) 5334
B) 5274
C) 4374
D) 4234

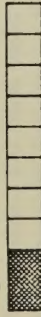
5. Make up a story problem that can be solved by using the number sentence: $6 + 8 =$

90%

3. Which one of the following word problems can be solved by using the expression $24 - 8$?
A) There are 8 blue pencils. There are 24 red pencils. How many pencils in all?
B) There are 8 blue pencils. There are 24 red pencils. How many more red pencils are there?
C) There are 8 boxes of pencils. How many pencils in all?

%

6. Write the decimal represented by the shaded area in the diagram below.



%

Most Students:

1. Which of the following word problems can be solved by using the expression $2(24 + 8)$?
a) There are 8 blue pencils, 2 green pencils and 24 red pencils. How many pencils in all?
b) There are 8 blue pencils. There are 24 red pencils. How many more red pencils are there?
c) In each of the 2 tins there are 24 red pencils and 8 blue pencils. How many pencils are there all together?

%

2. A bird flying at 9 km/h flies 8 times slower than a duck. If a plane travels at 864 km/h, how many times faster does it fly than the duck?

%

3. Find the quotient $63 \overline{)567}$.
A) 19
B) 14
C) 9
D) 4

%

Some Students:

1. Make a story problem that can be solved by using the expression $7 + 1.25 =$

%

2. Create a story problem using these numbers: $1.50, \frac{1}{2}$
Show the solution for your problem.

%

3. $1\frac{3}{8} - \frac{4}{8}$

%

4. $8 + 0.1 =$

29.5%

5. $4.25 \times 3.60 =$

%

6. Divide 423.6 by 0.12.
A) 35.30
B) 35 300
C) 3 453.5
D) 3 530

%

Outcome J-3.1

STRAND 3: SPATIAL SENSE AND GEOMETRY

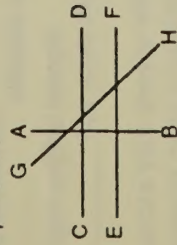
CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Use motion geometry to verify the basic properties of figures and to recognize and create patterns and designs.	All students will: - recognize, discuss and continue a pattern using manipulatives; - determine and generate tessellations. In addition, most students will: be able to describe the motion of geometrical figures, and create patterns and designs using a minimum of two figures. In addition, some students will: - be able to describe complex movement, both orally and symbolically, providing more than one solution; - create and discuss a complex tessellation.	- use motion geometry to investigate, explore and explain the characteristics of a number of real life geometric figures. - demonstrate motion geometry by using concrete materials (pattern blocks, geoboards) and explain the findings in their own words. - apply an understanding of motion geometry to a variety of problem solving situations. - use symmetry, congruence and motion to explain the properties and/or uses of many geometric shapes. - demonstrate motion geometry in problem solving situations using concrete materials (pattern blocks, geoboards) and explain using appropriate mathematical terminology. - apply an understanding of motion geometry to a variety of more complex problem solving situations (puzzles, wall papering and perimeter, area investigations). - demonstrate motion geometry by using a variety of materials and explain using the characteristics of the motion (direction, magnitude, turn point, degree of movement) in mathematical language

STRAND 3: SPATIAL SENSE AND GEOMETRY

Outcome J-3.1

All Students:

1. Railway tracks are an example of parallel lines. Which 2 lines in this diagram are parallel?



- A) AB and EF
B) EF and GH
C) AB and GH
D) CD and EF

91%

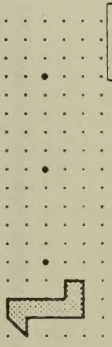
2. Which one of the patterns below is made by repeated slides of the figure on the right?



- A) B)
C) D)

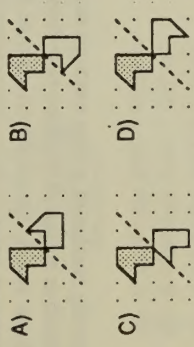
%

3. Use this figure to make a strip pattern by repeating a 1/2 turn about the centres indicated.



%

4. Which one of these diagrams shows a figure and the image formed by a flip over the dotted line?



%

5. Given a specific number of 3D shapes select the most appropriate shape for a commercial product and provide a rationale for that decision.

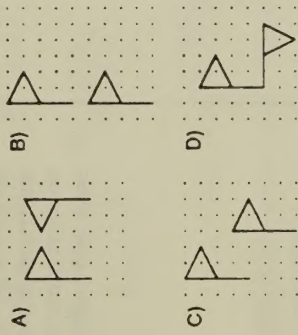
%

6. Given a quilt, wallpaper or wrapping paper pattern: Identify the specific motions involved in its creation. Extend a pattern based on any shape.

%

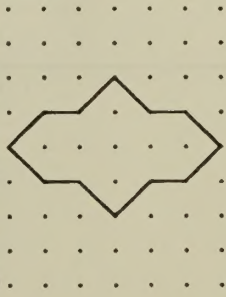
Most Students:

1. Circle the two diagrams that show a slide.



68.7%

2. Estimate the area of this figure in square centimetres.



- A) 8 cm²
B) 12 cm²
C) 20 cm²
D) 10 cm²

%

3. Choose a unique item and design a container for that item.

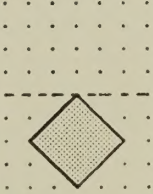
%

4. How many squares are there in the design below?



Answer %

5. Draw the image formed by flipping the given figure over the dotted line.



%

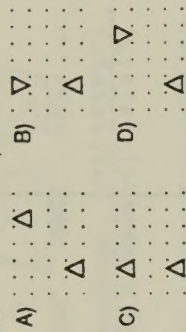
6. Given a quilt, wallpaper or wrapping paper pattern:

- a) Identify all slides, flips, and turns involved in its creation.
b) Design a pattern using regular shapes.

%

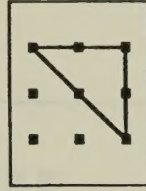
Some Students:

1. Which diagram shows a figure and the image formed by a slide of 3 units up?



%

2. Use a 9-pin geoboard and elastic bands:



- a) How many different triangles can be made?
b) What about quadrilaterals?
c) Have I got them all?
d) Can these shapes be classified in different ways?

%

3. Given a quilt, wallpaper or wrapping paper pattern:
a) Using mathematical terminology, describe the motions involved in the creation of the pattern.
b) Design a pattern using irregular shapes.

%

STRAND 3: SPATIAL SENSE AND GEOMETRY

All students:

1. Complete the blank with "always", "sometimes but not always" or "never" to make a true statement.

A right-angled triangle _____ has acute angles.

Illustrate your answer with two examples or an explanation.

%

2. Given the students one of the following objects: rectangular solid, triangular prism, square pyramid, cube, triangular pyramid. Say:

- a) Show me an edge that is congruent to this edge.
b) How many edges are there that are congruent to this edge?
c) Show me a face that is congruent to this face.
d) How many faces are there which are congruent to this face?

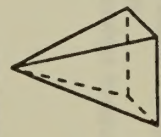
%

3. Which of the following figures is congruent to ?

A) B)
C) D)

82%

4. This figure has:



- A) 4 vertices and 7 edges
B) 5 vertices and 7 edges
C) 4 vertices and 8 edges
D) 5 vertices and 8 edges

%

Most Students:

1. The parallelogram is:

A) B)
C) D)

75%

2. Which figure has only 1 line of symmetry?

A) B)
C) D)

72%

3. Which unit is commonly used to measure the area of a room?

- A) square millimetre (mm²)
B) square centimetre (cm²)
C) hectare (ha)
D) square metre (m²)

76%

Some Students

1. When diagonals are drawn on polygons,

3-sided
 4-sided
 5-sided
...

Number of sides	3	4	5	6	7
Number of diagonals	0	2	5	9	14

the number of diagonals in a 7-sided polygon is:

- A) 11
B) 12
C) 13
D) 14
E) 15

%

2. One of the geometric figures shown below has exactly 4 lines of symmetry. Which one is it?

A) Square
B) Regular Hexagon
C) Rectangle
D) Equilateral Triangle

- A) A
B) B
C) C
D) D

%

Outcome J-4.1

STRAND 4: PATTERNING AND ALGEBRA

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Identify and describe patterns and functions in several ways, and explore the relationships among them.	All students will: recognize, extend and explain simple patterns in a variety of modes. In addition, most students will: analyze, predict and extend more complex patterns. In addition, some students will: analyze, predict and extend more complex patterns, including the development of generalizations.	- demonstrate an understanding of patterns through the use of concrete materials, calculators, language, drawing and computers. - recognize, extend, and create simple number and 2- and 3-D shape patterns. - investigate real life uses of patterns (i.e. classification). - predict the next element or term in a simple pattern. - skip count by 2s, 3s, 5s and 10s from any starting point. - determine the rule that governs a sequence. - extend a sequence (before and after) when three numbers or geometric figures are given using only one variable. - recognize, extend, and create more complex patterns and models in number, geometry, measurement and problem solving, when appropriate. - explain the applications of patterns in simple, real life situations. - discern missing terms from within a simple pattern. - skip count by 6s, 7s, 8s and 9s from any starting point less than 100. - determine missing elements within a simple pattern. - investigate and explain the applications of patterns in more complex patterns in real life situations. - understand and use the concept of variable within simple number sentences. - discern missing terms from within a more complex pattern and create simple patterns. - skip count by 6s, 7s, 8s and 9s from any starting point. - create simple patterns. - determine missing elements within a more complex pattern.

STRAND 4: PATTERNING AND ALGEBRA

Outcome J-4.1

All Students:

1. Given a specific number of 3D shapes select the most appropriate shape for a commercial product and provide a rationale for the decision. %
2. Given a quilt, wallpaper or wrapping paper pattern, identify the specific motions involved in its creation. Extend a pattern based upon any shape. %
3. Use manipulation to represent the following numbers:
4.6, 4.06, 4.006... %
4. Using interlocking cubes (or tiles) make shapes like this and find the required perimeters. (Note each cube is 2 cm. long). %
5. Enter 1 2 3 4 5 on your calculator. Show 3 different ways you can change the number to 1 2 8 4 5. %
6. Find the next 2 terms in the sequence 2, 3, 5, 6, 8, ...
Create a similar sequence starting with 5. %
7. Using motion geometry, tessellate the plane using an isosceles triangle. %

Most Students:

1. If $a = 4$ and $b = 2$, what is the value of $5a - b$? 61%
- A) 7
B) 10
C) 18
D) 22
2. If $5y + 6 = 16$, what does y equal? %
- A) 2
B) $4\frac{2}{5}$
C) 10
D) 22
3. When a number "n" is doubled and then increased by 6, the result is 10. The open number sentence or equation is:
A) $2 + n + 6 = 10$
B) $2n - 6 = 10$
C) $2n + 6 = 10$
D) $2(n - 6) = 10$
E) $2(n + 6) = 10$ %
4. Using the geoboard find areas of squares that are arranged obliquely. %
5. At Foster Robbins, an ice cream parlour, they have 5 flavours of ice cream. How many double scoop ice cream cones can you order? %
6. Write the 8th, 9th and 10th terms for the numbers given below:
1, 1, 2, 3, 5, 8, 13, ... %
7. $\frac{\quad}{\quad} \times \frac{\quad}{\quad} = \frac{\quad}{\quad}$ 65%
- Use the digits 4, 5, 6, 7 & 8 only once and any operation keys to complete the problem. %
8. Given a quilt, wallpaper or wrapping paper pattern, identify all slides, flips and turns involved in its creation. Design a pattern using regular shapes. %

Some Students:

1. $\frac{\quad}{w} \div \frac{\quad}{l}$

The distance around the rectangle above is exactly 12 m. The length of the rectangle is l metres and the width is w metres. Which of the following could be the values of l and w ?
A) $l = 10, w = 2$
B) $l = 8, w = 4$
C) $l = 4, w = 4$
D) $l = 4, w = 2$ 39%
2. If you measured an object with 5 different rulers and got 5 different answers, how would you decide which answer was correct? Explain. %
3. A number "n" is increased by 4 and the sum is multiplied by 5. If the result is 25, then the open number sentence is:
A) $n + 4 \times 5 = 25$
B) $n \times 5 + 4 = 25$
C) $(n + 4) \times 5 = 25$
D) $(n - 4) \times 5 = 25$
E) $n - 4 \times 5 = 25$ %
4. How many routes from A to B going east and north?

AB

%
5. Using more complex quadrilaterals such as a chevron, tessellate the plane. %
6. Given the shape below made of 6 square tiles, with a perimeter of 12, what is the most tiles you can add and have a perimeter of 18? %
-

Outcome J-5.1

STRAND 5: DATA MANAGEMENT AND PROBABILITY

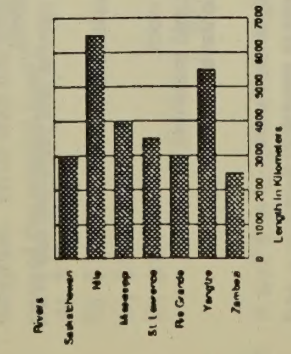
CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Collect, organize, display and interpret data, integrating the concepts of chance and probability through investigation and application.	All students will: interpret data by drawing reasonable conclusions and making simple predictions given the collection, organization and display of information. In addition, most students will: develop an hypothesis, collect, organize, display and interpret information by drawing reasonable conclusions, and making predictions. In addition, some students will: explain their predictions in terms of their probability.	- select a problem and formulate simple questions to generate data. - make a decision about what is important to collect. - represent data using concrete, pictorial and abstract form. - use computers to manipulate data and display in variety of forms. - use a simple electronic spreadsheet. - given a graph, pose a problem. - select a problem and formulate more complex questions to generate data. - collect data from a variety of sources. - use primary and secondary sources of data. - select from a range of formats the most suitable format for displaying data. - recognize that the concept of probability can be applied in a wide variety of contexts, and falls within a range from "something never happening" to "something always happening". - realize that outcomes of many activities are unpredictable. - predict in a variety of situations (blocks in bag). - draw inferences from a graph. - identify the range from 0 to 1 with the range from "something never happening" to "something always happening". - hypothesize outcomes given specific data.

STRAND 5: DATA MANAGEMENT AND PROBABILITY

Outcome J-5.1

All Students:

1. LENGTH OF SEVEN MAJOR RIVERS



According to the above graph, the river that has a length of 3 500 km is:

- A) Rio Grande
B) St. Lawrence
C) Zambezi
D) Saskatchewan

93%

2. ATOM HOCKEY RESULTS

TEAM	WON	LOST	TIED
Eagles	12	2	2
Hawks	9	6	1
Owls	7	4	5
Gulls	6	7	3

Which teams won more than half their games?

- A) Hawks and Eagles
B) Eagles and Owls
C) Owls and Gulls
D) Hawks and Gulls

82%

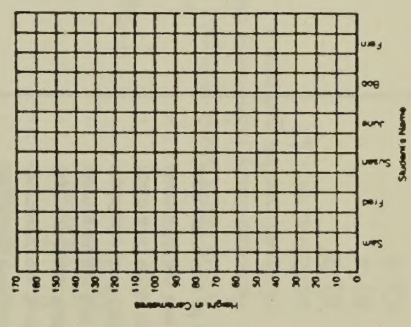
Most Students:

1. STUDENT HEIGHTS: CLASS 6A

STUDENT'S NAME	HEIGHT
Sam	150 cm
Fred	130 cm
Susan	140 cm
June	140 cm
Bob	130 cm
Fern	140 cm

Using the information above, complete the vertical bar graph below only for Alex.

STUDENT HEIGHTS: IN CLASS 6A



71%

2. AGE OF STUDENTS IN ROOM 5

AGE IN YEARS	8	9	10
Number of students	8	10	6

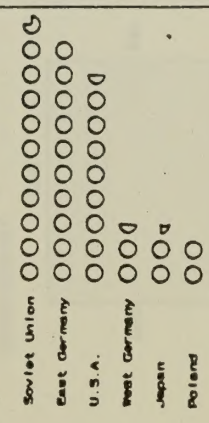
There are 24 students in Room 5. The fraction of students who are 8 years old is:

- A) $\frac{1}{4}$
B) $\frac{1}{3}$
C) $\frac{1}{2}$
D) $\frac{1}{6}$

63%

3. Which 2 countries together won as many medals as the Soviet Union?

TOP COLD MEDAL WINNERS AT 1978 WINTER OLYMPICS



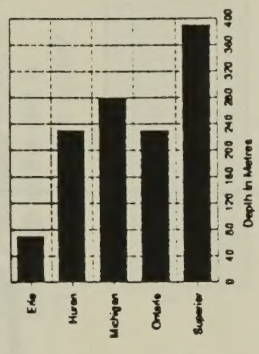
Each gold medal represents 4 golds

- A) East and West Germany
B) U.S.A. and West Germany
C) Poland and U. S. A.
D) Japan and U. S. A.
E) East Germany and Japan

%

Some Students:

1. DEPTH OF THE GREAT LAKES

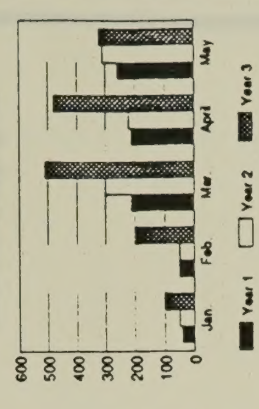


Lake Erie is what fraction of the depth of Lake Michigan?

- A) $\frac{1}{4}$
B) $\frac{4}{1}$
C) $\frac{3}{4}$
D) $\frac{1}{3}$
E) $\frac{3}{1}$

%

2. NUMBER OF TOURIST INQUIRIES ABOUT CANADA



- a) In year 2 which month shows the second highest number of inquiries?

- A) January
B) February
C) March
D) April
E) May

- b) For each of the 3 years, which month shows at least 250 inquiries?

- A) January
B) February
C) March
D) April
E) May

%

Outcome J-6.1

STRAND 6: ESTIMATION AND MEASUREMENT

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Estimate, measure and record temperature, length, area, capacity, volume, mass, money and time using appropriate units.	All students will: select an appropriate unit of measure, make a reasonable estimate, and verify the estimate with appropriate instruments.	- develop an understanding of temperature in relation to a personal frame of reference (e.g. freezing point). - estimate, read, and record temperature using different kinds of thermometers (e.g. oven, candy, alcohol, digital and mercury) in a variety of contexts (times and locations). - understand the relationships among seconds, minutes, hours, days, months and years and use in the context of real life situation. - develop an understanding of time in relation to a personal frame of reference. - write numeric dates. - estimate, read and record time using an analog, digital and 24 hour clock. - use appropriate organizers to manage time (e.g. journals, calendars and timelines). - demonstrate the concept of perimeter and relate its use to real life contexts. - choose the appropriate unit to use in measuring distance. - estimate, measure accurately and record distance using appropriate standard units. - explain the concept of area, its application and describe the units used to measured it. - estimate and use a variety of resources to find the area of different regular and irregular shapes. - explain the concept of capacity/volume, its application and describe the units used to measured it. - estimate and measure containers to find volume and record in cubic cm.; apply to real life situations. - estimate, measure and record the capacities of containers to the nearest millilitre and litre; apply to real life situations. - estimate, measure and record the mass of various objects to the nearest gram and kilogram. - demonstrate that objects of different shapes can have the same mass. - demonstrate that objects of the same shape can have different masses. - estimate and calculate amounts to more than \$100. - read and write money values to \$100,000.00 using a variety of forms. - demonstrate the interrelationship between coin and note values. - use amounts of money less than \$20 in meaningful ways (e.g., provide correct change).

STRAND 6: ESTIMATION AND MEASUREMENT

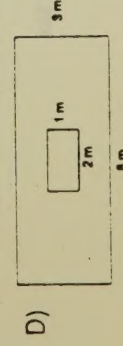
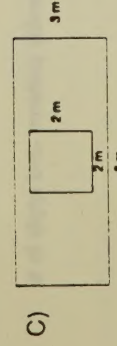
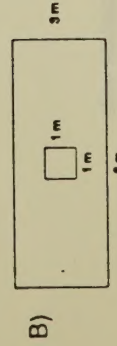
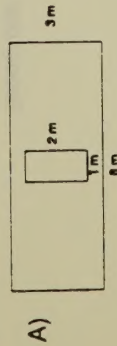
Outcome J-6.1

All Students:

1. Father purchased 3 kg of ground beef at \$4.25 a kilogram. What was the total cost of the ground beef?
- A) \$12.65
B) \$12.95
C) \$12.85
D) \$12.75

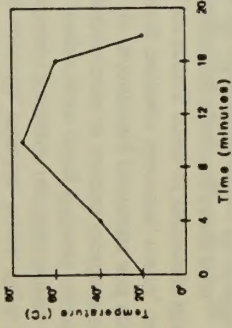
88%

2. A wall 8 m long and 3 m high has a window 2 m long and 1 m high. Which of the following could be a diagram of this wall?



85%

3. HEATING AND COOLING OF SOLID 'A'



In a science class a solid was heated and then the heat was removed.

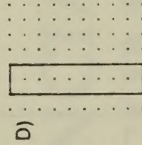
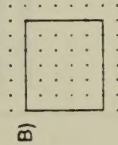
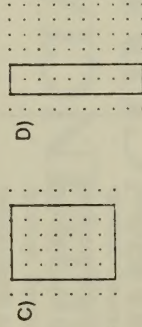
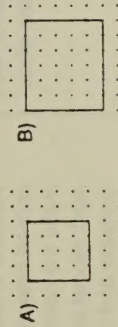
- a) How long was the solid being heated?
- A) 4 min.
B) 8 min.
C) 10 min.
D) 16 min.
E) 18 min.

- b) How long did it take to cool to its original temperature?
- A) 4 min.
B) 8 min.
C) 10 min.
D) 14 min.
E) 16 min.

%

Most Students:

1. Which figure has the largest perimeter?



77%

2. Which of the following is the greatest volume?

- A) 750 mL
B) 1 L
C) 1500 mL
D) 2L

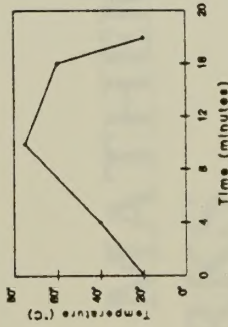
79%

3. A cup holds about 250 mL. Approximately how many cups of liquid can be put into a container of 1 L?

- A) 2
B) 4
C) 6
D) 8

63%

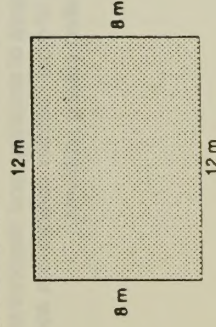
4. In a science class a solid was heated and then the heat was removed. What was its temperature 5 minutes after the experiment began?



- A) 30°C
B) 40°C
C) 45°C
D) 50°C
E) 60°C

%

5. How many square metres of carpeting are needed to cover a playroom floor with these dimensions?

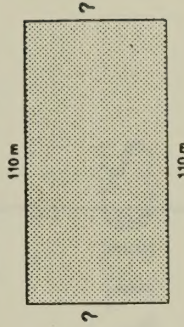


- A) 40 m
B) 96 m
C) 40 m²
D) 96 m²

38%

Some Students:

1. The boards around Bronte Creek's outdoor skating rink have a perimeter of 330 m. If the length of the rink is 110 m, what is the width?



- A) 220 m
B) 55 m
C) 3 m
D) 50 m

%

STRAND 6: ESTIMATION AND MEASUREMENT

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Outcome J-6.1 (continued)	In addition, most students will: select an appropriate unit of measure, make a reasonable estimate, and verify the estimate with appropriate instruments, with a greater degree of precision, and make simple conversions when solving problems.	- interconnect the language of time to analog and digital clocks. - translate analog to digital and digital to analog time. - convert time units among seconds, minutes, hours, days, months and years. - make the connections between fractional representations and time. - read, record and predict temperature using different sources in a variety of contexts over time. - compare and contrast temperatures at various locations over time. - discover generalizations for determining perimeter and apply to real life situations. - demonstrate the relationship between kilometre, metre, centimetre and millimetre. - discover generalizations for finding areas of rectilinear shapes using appropriate square units. - illustrate that different shapes can have the same area. - illustrate that figures with equal perimeters can have different areas. - develop generalizations for finding the volume of familiar solids in cubic metres and cubic centimetres and apply to real life situations. - convert units of measure (e.g., litres to millilitres, grams to kilograms). - use amounts of money less than \$100 in meaningful ways, provide change using the fewest number of coins and/or bills. - understand the interrelationships between money and our number system. - make the connections between fractional/decimal representations and money.
	In addition, some students will: select an appropriate unit of measure, make a reasonable estimate, and verify the estimate with appropriate instruments with a high degree of accuracy, and demonstrate an understanding of more complex conversions and relationships, when solving problems.	- investigate time units beyond a year. - become aware of and investigate time zones. - estimate, measure and record the duration of an event using appropriate units. - investigate different temperature scales and suggest possible uses (Celsius, Fahrenheit and Kelvin). - identify patterns in temperatures, interpret and make predictions. - use the table of equivalence for standard linear measurements, identify patterns and apply in a meaningful context. - discover generalizations for finding areas of standard shapes. - apply their understandings of area to a variety of shapes. - use the table of equivalence for standard mass measurements, identify patterns and apply in a meaningful context. - discover the relationship of percentage to interest rates, sales and tax.

ONTARIO PROVINCIAL MATHEMATICS BENCHMARKS

Transition Years
(end of Grade 9)

Outcome T-1.1

STRAND 1: INQUIRY AND PROBLEM SOLVING

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Using a variety of strategies, pose and solve a wide range of everyday problems across subject areas.	All students will: • solve and pose simple routine problems using a variety of strategies; • justify the solution. In addition, most students will: • solve and pose complex multi-stage problems using a variety of strategies; • justify and explain the solution. In addition, some students will: apply problem-posing, problem-solving and communication skills to cross-curricular activities involving complex multi-stage solutions.	- rephrase, organize and generate solutions using a variety of strategies to solve problems across mathematical strands. - create a simple routine problem using a variety of resources. - independently solve simple inquiry problems in context across the strands of mathematics. - collaboratively, create a simple inquiry problem using a variety of resources. - communicate and evaluate the solution and process. - demonstrate curiosity, flexibility and perseverance. - demonstrate increasing confidence in solving real-life problems. - rephrase, organize and generate solutions to complex multi-stage problems using a variety of strategies to solve problems across mathematical strands. - create a complex multi-stage problem using a variety of resources. - given a simple problem in context, rephrase, organize and generate solutions with increasing independence using various strategies. - solve simple inquiry problems across the strands of mathematics. - solve complex inquiry problems through a variety of strategies in a collaborative manner. - solve abstract problems requiring different strategies and concepts. - generalize from a specific situation. - given a complex problem in context, rephrase, organize and generate solutions using numerous strategies to solve complex inquiry problems across the strands of mathematics. - collaboratively, create a complex inquiry problem using a variety of resources.

STRAND 1: INQUIRY AND PROBLEM SOLVING

Outcome T-1.1

All Students:

1. Peter and Juanita decided to start saving money. Peter can save 3 dollars each month and Juanita can save 5 dollars each month. At this rate, after now many months will Juanita have exactly 10 dollars more than Peter?

55%

2. Jane Kimble, a grocer, checked her supply of milk and counted 80 containers. Some were 2 L cartons and others were 3 L bags. Altogether there was a total of 220 L of milk. How many of the containers were 3 L bags?

Explain what you are to find in your own words.

Show all your work.

%

3. A radio, normally selling for \$160.00, is on sale at a 25% discount. What is the sale price of the radio? (Show all work).

%

Most Students:

1. On the beach during the summer, Nina collected white and pink shells. On the first day, she found 2 white shells and 1 pink shell. On the next day, she found 4 white shells and 4 pink shells, and on the third day she found 6 white shells and 7 pink shells. If this pattern continued, on what day did she find 6 more pink shells than white shells?

36%

2. The sale at Bill's Record Shop advertises 3 albums for \$19.95. Jarmila wished to purchase 2 albums. How much did she pay for the 2 albums? (Show all work).

%

3. Hansel has a box of Smarties. Every day he eats $\frac{1}{3}$ of the Smarties left in the box. Later in the day, his sister Gretel eats 8 of the Smarties. It takes 3 days for Hansel and Gretel to eat the box of Smarties.

- a) How many Smarties were in the box? Show your work.
- b) What fraction of the Smarties did Gretel eat (in lowest terms)?

(Answer)

%

4. Backster's food store has 2304 oranges to be packed in bags of 12 oranges each. If 24 bags are placed into a box, how many boxes are there altogether?

%

5. At a Toyota plant 65 cars were built on Thursday. Of these, 38 were bronze and the remainder blue. If 6 cars had damaged parts, how many were blue?

%

6. Alexandra walked from Riverview to Bridgeport, which are 3.1 km apart. During her walk she lost her watch, went back 1.7 km to find it, and then continued in the original direction until she reached Bridgeport. How many kilometres had Alexandra walked altogether when she arrived at Bridgeport?

%

Some Students:

1. Tin Jee collects hockey cards. When they are stacked in equal piles of 2 or equal piles of 3, there is 1 left over. However, with piles of 5, there are none left over. If she has fewer than 50 hockey cards, how many cards does she have?

29%

2. John counted the legs of dogs and children at a dog show in the park. There were a total of 80 legs. If the difference between the number of children and the number of dogs was 1, how many dogs and children were there at the dog show?

20%

3. A contest was held to guess the number of peanuts in a jar. Four wrong guesses were made: Sabrina, 163 peanuts; Pierre, 169; Yasmine, 178; and Carlos, 185. One of these guesses was wrong by 1, another by 6, another by 10, and another by 16. How many peanuts are there?

28%

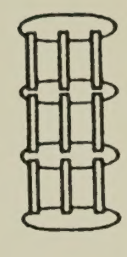
4. A soccer team earns 2 points for a win and 1 point for a tie. The team won twice as many games as it tied and lost no games. If the team scored a total of 15 points, how many games did it play?

23%

5. A recipe for fruit punch requires that ginger ale and pineapple juice be mixed in a ratio of 3 to 5 by volume respectively. If 12 litres of gingerale are used, how many litres of pineapple juice are added?

%

6. A fence is made up of rails and posts like this:



Find a formula connecting the number of posts and the number of rails for any length of fence. Explain why it works.

%

Outcome T-2.1

STRAND 2: NUMBER SENSE AND NUMERATION

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Use computational estimation and mental calculation to judge the validity or reasonableness of answers in a variety of contexts.	All students will: use estimation skills and mental calculation to make decisions about situations that are common in everyday life.	- determine the best buy from a series of items. - estimate purchases involving percentages, such as discounts, sales tax, tips. - estimate the amount of time required per task when presented with a series of tasks. - can detect an error in a bill. - determine number of items that can be purchased with a fixed amount of money.
	In addition, most students will: judge the reasonableness of information from a variety of media sources and assess when an estimate or an exact answer is required in a problem solving setting.	- identify bias, misleading information or claims involving numbers in the media. - explain whether a number used in the media is an exact or estimated value (e.g., if TV news reported that 50,000 people died in this flood - is this an exact number?). - justify whether an estimate or exact answer is required in a variety of situations.
	In addition, some students will: transfer estimation skills to technological applications and to other subject areas in the curriculum.	- evidence will be obtained from other subject areas.

STRAND 2: NUMBER SENSE AND NUMERATION

Outcome T-2.1

All Students:

1. For each situation below, state whether an exact answer or an estimate would be more appropriate. Give a reason in each case.
- a) You have been presented with a bill for \$24.75 in a restaurant. You wish to leave a tip, which customarily is 15%.
 - b) A store clerk is calculating the GST on a dress that sells for \$79.95.
 - c) The cashier at a grocery store is giving change from a \$50-bill on a grocery total of \$34.53.
 - d) You and your parents are planning the cost of a summer vacation.
2. Given a newspaper or magazine article, identify whether the numbers used in the article represent exact values or estimates. Explain your answer in each case, including references to words or phrases in the article that indicate exactness or estimation.

%

4. In a survey of 120 Grade 9 students, 90 replied that they talked on the telephone at least once a day. What per cent of those surveyed talked on the telephone at least once a day?
- A) 25%
 - B) 30%
 - C) 75%
 - D) 90%

%

Most Students:

Tests of skill in estimation must be timed so that the student has sufficient time to produce a reasonable estimate, but not enough time to calculate the answer exactly.

1. Estimate the value of:

- A) $5\frac{3}{4} + 8\frac{1}{6}$
- B) $\frac{1}{4}$ of 352
- C) $4\frac{1}{2} \times 8\frac{1}{2}$
- D) 9% of \$28.95
- E) 36% of 210
- F) $\sqrt{136}$

%

2. You are trying to decide between two brands of hairspray whose quality you like equally. One brand offers 300 mL for a price of \$2.89, and the other offers 350 mL for a price of \$3.75. Which is the better buy?

%

3. The expression 0.40×6.38 is equal to:
- A) 0.2552
 - B) 2.452
 - C) 2.552
 - D) 24.52
 - E) 25.52

61%

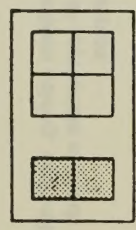
4. In a grade 7 classroom, 23 out of 30 students are right-handed. About what percent of students are right-handed?

%

5. Jill works at The Roasted Chicken and has an hourly wage of \$4.80. After three months, her hourly wage will be increased by 5%. Her new hourly wage will be:
- A) \$0.24
 - B) \$5.04
 - C) \$5.52
 - D) \$7.20

67%

6. A shaded figure and an unshaded figure are shown below:



The ratio of the area of the shaded figure to the area of the unshaded figure is:

- A) 1:4
- B) 1:2
- C) 4:1
- D) 2:1

60%

Some Students:

1. How many kilograms of food have you eaten in the past year?

%

2. If everyone in Canada put a brick in the reservoir of each toilet in their house, how much money would be saved in a year?

%

3. How long would it take a typical 13-year-old to walk from your city hall to the new city hall in Toronto?

%

4. A record album that sells for \$11.00 at the regular price is on sale for \$8.80. The percentage discount off the regular price is:
- A) 80%
 - B) 25%
 - C) 22%
 - D) 20%

%

5. The best estimate of $\frac{75 \times 703}{7300}$ is:
- A) 800
 - B) 80
 - C) 8
 - D) 0.8

%

Outcome T-2.2

STRAND 2: NUMBER SENSE AND NUMERATION

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Demonstrate in context, with or without the use of a calculator, a thorough knowledge of arithmetic facts and accurate computational and mental calculation skills, involving whole numbers, decimals, fractions, percent, integers, ratio and rate, powers and square root.	All students will: use appropriate methods of computation involving whole numbers, decimals, fractions, percent, integers, ratio and rate, powers and square root in a variety of everyday situations.	- convert a number from one form to another. - know and apply basic arithmetic facts. - choose the appropriate computational method from among mental calculation or estimation, hand calculation, calculator or computer. - illustrate through the use of a variety of techniques the concepts of and operations with whole numbers, decimals, fractions, percent, integers, ratio and rate. - do simple mental calculations involving whole numbers, decimals, fractions, percent, integers, powers and square root. - with or without a calculator, perform basic operations involving whole numbers, decimals, fractions, percents, integers, ratio and rate. - multiply and divide simple fractions. - use a calculator to evaluate expressions involving whole number powers and square roots of whole numbers and decimals. - make decisions in simple situations involving ratios and rates (unit pricing, fuel efficiency, wages). - solve one- or two-step problems where all needed information is given and there is no unnecessary information. - identify exponent rules for multiplication and division through patterning investigations involving the base 10 and whole number exponents. - apply exponent rules for multiplication and division in simple examples involving only base 10 and whole number exponents. - write large numbers in scientific notation.
	In addition, most students will: in a setting of applications, problem solving, and problem posing, demonstrate the use of appropriate methods of computation and mental calculation.	- know and apply the limitations of four function calculators (ability to display very large and very small numbers, order of operations, comparison with scientific calculators). - pose and solve multi-step problems involving whole numbers, decimals, fractions, percent, integers, ratio and rate, powers and square root. - solve multi-step problems where additional information is needed.
	In addition, some students will: use a variety of strategies to solve, extend and pose multi-step problems.	- create extensions to problems - pose new problems by creating variations of given problems - solve abstract problems drawing on many concepts

STRAND 2: NUMBER SENSE AND NUMERATION

All Students:	
1. Using any suitable technique, explain why: a) $\frac{1}{3}$ is greater than $\frac{1}{4}$ b) $4 + \frac{1}{2} > 4$ c) doubling a price is the same as increasing the price by 100% d) if a number has an odd number of factors, the number is a perfect square	%
2. Jim's mother used 50 litres of gasoline to travel 475 kilometres. Determine her fuel consumption in kilometres per litre.	%
3. The normal price of a dress is \$89.95. The dress is on sale at a discount of 20%. Determine the sale price of the dress.	%
4. Which symbol (+, -, x, +) must replace the box to make a true statement? (4 + 6) 2 - 5 = 0 a) + b) - c) x d) ÷	%
5. Soda pop is on sale in the grocery store. a) You can buy 24 cans for \$6.99. If each can contains 0.355 litres, determine the price of the pop per litre. b) You can also buy pop in 1.5 litre bottles at \$1.39 per bottle. Determine the price per litre of the pop in bottles. c) Which is the better buy -- the cans or the bottles?	%
6. a) A ladder is placed so that the foot of the ladder is 2 m away from a wall and the top of the ladder is 6 m up the wall. Determine the length of the ladder. b) Is this a safe placement of the ladder?	%
Most Students:	
1. Mentally calculate: a) 125 + 275 b) 90 x 70 c) 4800 + 60 d) $\sqrt{1.44}$ e) $2\frac{1}{4} + 1\frac{3}{4}$ f) 25% of 160 g) -57 + 9 h) $\frac{7}{8} \times \frac{1}{2}$	%
2. A human heart beats approximately 72 times per minute. Today, Angelina celebrated her 85th birthday. Use your calculator to determine approximately how many times her heart has beat in her lifetime. Write the answer displayed by your calculator and explain it.	%
4. Jim's mother filled her car's tank with gasoline and then drove 475 km. She then filled the tank again, needing \$25.00 worth of gasoline at 50¢ a litre. On average, what was her fuel consumption: a) in km per litre b) in litres per 100 km	%
5. The normal price of a dress is \$89.95. The dress is on sale at a discount of 20%. Calculate the final cost of the dress to a customer, including 8% P.S.T. and 7% G.S.T..	%
Some Students:	
1. The bases on a baseball diamond are about 27.4 m apart. An ant travels at about 8.9 cm per minute. About how many days would it take the ant to travel the distance covered by Blue Jay Joe Carter while running the bases for the homeruns that he hit during the 1991 season?	%
2. a) A boy is selling advertisements for his school newspaper. The sizes available for the ad's are: 1 whole page, $\frac{1}{2}$ page, $\frac{1}{4}$ page. $\frac{1}{8}$ page, $\frac{1}{16}$ page. How many different combinations of advertisements could be used to fill one page? b) Extend or create a variation of the problem above. Explore the new problems that you have posed. Be prepared to provide both oral and written explanations of the processes you used in creating and solving the new problems.	%

Outcome T-3.1

STRAND 3: SPATIAL SENSE AND GEOMETRY

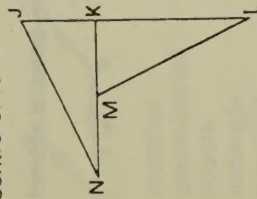
CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Demonstrate spatial sense and understanding of geometric relationships by investigating two dimensional, three dimensional, and transformational geometry.	All students will: investigate and apply a wide variety of geometric relationships in two and three dimensions through measurement and construction activities.	- build 3-D geometric shapes from 2-D drawings. - classify triangles, quadrilaterals, pyramids, prisms. - use manipulatives (i.e. tangrams, interlocking blocks, geoboards, pattern blocks) to continue a 2-D or 3-D pattern. - create a geometric design that illustrates geometric properties such as symmetries or tessellations. - compare and classify geometric figures. - investigate relationships among perimeter, area, and volume. - carry out the traditional geometric constructions using the standard geometric equipment.
	In addition, most students will: demonstrate spatial sense and understanding by solving problems involving two dimensional, three dimensional, and transformational geometry.	- state and apply the properties of isosceles, equilateral and right angle triangles and inscribed quadrilaterals. - state and apply the Pythagorean theorem. - construct or draw geometric shapes given oral or written instructions. - draw 3-D geometric shapes with or without isometric dot paper. - draw orthographic drawings: (front, side, back view) given a 3-D geometric figure. - construct a 3-D geometric drawing given orthographic drawings. - identify the fundamental properties of translation, symmetries and rotation. - draw or graph the image of a figure on a grid under a translation, reflection, rotation and dilation.
	In addition, some students will: create and demonstrate geometric relationships in two dimensions and three dimensions by experimentation or through simulation.	- create a 2-D or 3-D model which illustrates a set of specific geometric shapes.

STRAND 3: SPATIAL SENSE AND GEOMETRY

Outcome T-3.1

All Students:

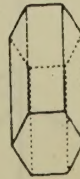
1. Triangle JKN can be rotated (turned) onto triangle MKL. The centre of rotation is:



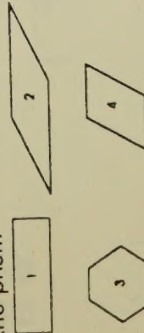
- A) point N
B) point M
C) point L
D) point K

77%

2. Study the prism below.



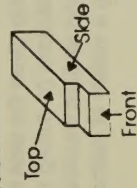
Which figure below can be drawn by tracing the faces of the prism



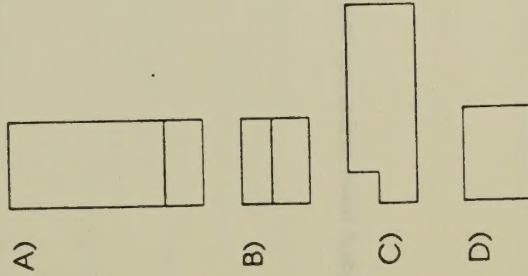
- A) only 2 and 3
B) only 2 and 4
C) only 1 and 4
D) only 1 and 3

84%

3. The diagram below shows an object with the top, front, and side labelled.



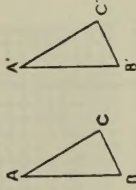
Which of the following views of the above object is the front view?



79%

Most Students:

1. $\triangle ABC$ and $\triangle A'B'C'$ are congruent and their corresponding sides are parallel.

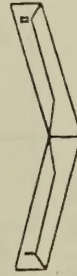


$\triangle ABC$ maps onto $\triangle A'B'C'$ by:

- A) a reflection
B) a glide reflection (slide flip)
C) a rotation (turn)
D) an enlargement
E) a translation (slide)

65%

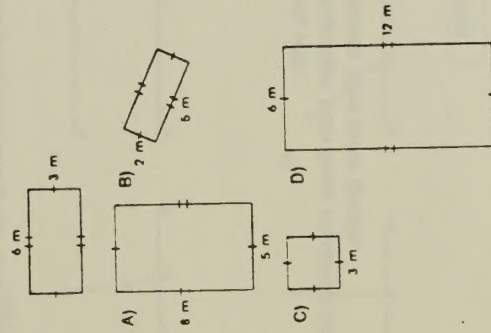
2. What transformation is needed to move from shape I to shape II below?



- A) reflection
B) $\frac{1}{2}$ turn
C) translation
D) $\frac{1}{6}$ turn

63%

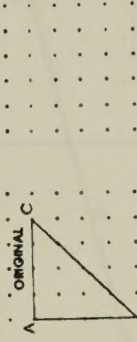
3. A rectangle similar to figure PQRS is:



65%

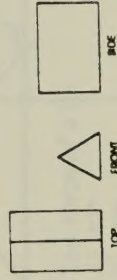
Some Students:

1. Draw on the grid a reduction of triangle ABC. Use a scale factor of 0.5.



35%

2. The front, top, and side views of a three-dimensional object are given below.



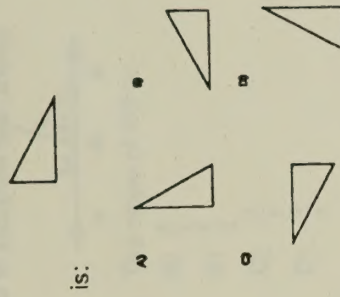
What type of object could be represented by these views?

- A) tetrahedron
B) triangular pyramid
C) triangular prism
D) trapezoid
E) hexahedron

%

35%

3. The figure below which best represents a 270° rotation of



is:

- A) B)

Outcome T-3.2

STRAND 3: SPATIAL SENSE AND GEOMETRY

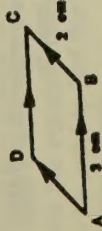
CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Use coordinate geometry to describe and represent relationships defined by tables, graphs, and equations or formulas.	All students will: be able to plot ordered pairs, read and graph information from tables. In addition, most students will: be able to graph relationships from linear equations and formulas as well as interpolate and extrapolate from linear graphs. In addition, some students will: graph non-linear relations.	- name the coordinates of points located on a grid. - draw figures on a grid given the coordinates. - draw a graph of a relationship given the data in tabular form. - draw graphs of numerical relations (including non-linear relations) using tables of ordered pairs derived from experiments and realistic situations. - solve linear equations using a variety of methods. - represent a simple relation taken from an everyday situation, using a table of values, a formula and a graph. - solve equations other than first degree using graphs.

STRAND 3: SPATIAL SENSE AND GEOMETRY

Outcome T-3.2

All Students:

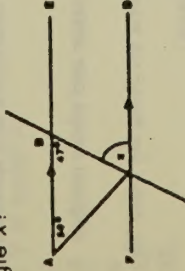
1. $\overline{AB} \parallel \overline{DC}$ and $\overline{AD} \parallel \overline{BC}$, then quadrilateral ABCD is a



- A) rhombus
B) parallelogram
C) square
D) rectangle
E) trapezoid

%

2. What is the measurement of angle x ?

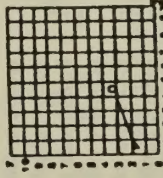


- A) 50°
B) 47°
C) 97°
D) 133°
E) 83°

%

Most Students:

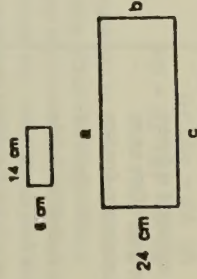
1. Which pair of points does the line segment PQ join?



- A) (1,-2) and (4,3)
B) (1,1) and (3,4)
C) (1,2) and (4,3)
D) (2,1) and (4,3)
E) (2,1) and (3,4)

%

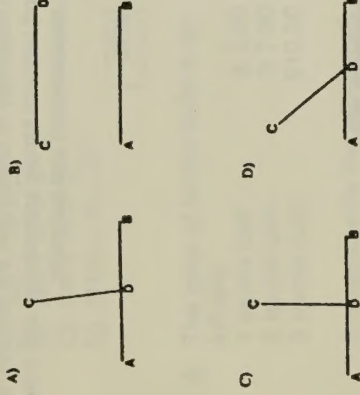
2. These rectangles are similar. What is the length of a ?



- A) 21 cm
B) 42 cm
C) 28 cm
D) 56 cm
E) 35 cm

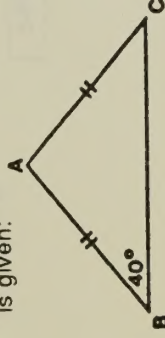
%

3. Which of the following figures shows CD perpendicular to AB?



65%

4. Triangle ABC is an isosceles triangle. The measure of $\angle B$ is given:



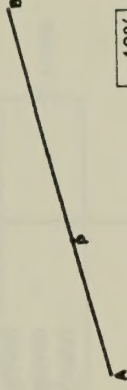
What is the measure of $\angle A$?

- A) 60°
B) 90°
C) 100°
D) 140°

70%

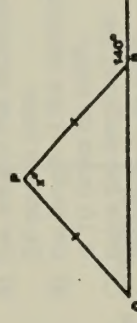
Some Students:

1. Construct a line through P perpendicular to AB.



40%

2. In the triangle below, $PQ \perp PR$.

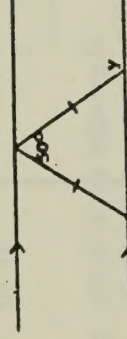


The value of x is:

- A) 40°
B) 70°
C) 80°
D) 140°

49%

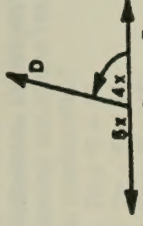
3. The value of angle y is:



- A) 50°
B) 130°
C) 65°
D) 115°

32%

4. Examine the graph below:

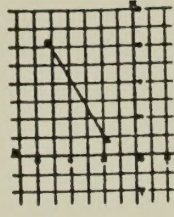


The slope of PQ is:

- A) $\frac{3}{5}$
B) $\frac{5}{3}$
C) $\frac{3}{5}$
D) $\frac{5}{3}$

47%

5. AB is a straight line.



What is the measure of angle BCD?

- A) 25°
B) 40°
C) 50°
D) 80°
E) 100°

%

Outcome T-4.1

STRAND 4: PATTERNING AND ALGEBRA

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Represent mathematics symbolically.	All students will: - investigate and extend simple patterns and relationships developed concretely to understand the concept of a variable; - develop and evaluate simple expressions and simple formulas relating to measurement and geometry.	- create and/or extend spatial patterns using concrete materials (pattern blocks, tangrams, interlocking cubes, algebra tiles, etc.); - investigate and extend patterns in measurement and geometry using concrete materials and semi-concrete materials (graph paper, dot paper, etc.), and then generalize to a formula. - substitute into and evaluate a given simple formula. - extend simple number sequences.
	In addition, most students will: investigate and extend more complex patterns both concretely and abstractly to develop a general term or formula.	- explore and extend numerical sequences with and without the use of calculators and spreadsheets - identify and extend a pattern and state the nth term. - substitute info and evaluate any given formula. - apply exponent rules for multiplication and division involving integral bases and whole number exponents. - identify the meaning of negative exponents through extension of patterns involving the base 10. - write large and small numbers in scientific notation. - using a scientific calculator, make calculations involving scientific notation.
	In addition, some students will: use patterns to model and solve problems.	- solve problems using the strategies of identifying a pattern and making a table. - investigate problem situations involving number structure and relationships. - apply the exponent rules for multiplication and division involving literal bases and integral exponents.

STRAND 4: PATTERNING AND ALGEBRA

Outcome T-4.1

All Students:

1. The cost of printing greeting cards consists of 2 parts: there is a fixed charge of 100 cents and a charge of 6 cents for each card printed. Circle the equation below that can be used to find the cost of printing n cards.
- A) Cost = $(100 + 6n)$ cents
 - B) Cost = $(106 + n)$ cents
 - C) Cost = $(6 + 100n)$ cents
 - D) Cost = $(106n)$ cents
 - E) Cost = $(600n)$ cents

%

2. $A = XY$. If $A = 12$ and $X = 3$, then Y is equal to:
- A) $\frac{3}{4}$
 - B) $\frac{4}{3}$
 - C) 4
 - D) 12
 - E) 36

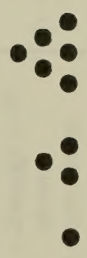
72%

3. Nigel works in a packaging factory in the summer. He earns \$32 per day and a bonus of \$2 for each of N orders that he packages. The formula that describes Nigel's total daily pay (P), in dollar, is:
- A) $P = (32 + N)2$
 - B) $P = 32 + 2N$
 - C) $P = 32N + 2$
 - D) $P = 32 + N$

66%

Most Students:

1. Marbles are arranged as follows:



If the pattern is continued, how many marbles are used in making the 8th figure?

- A) 28
- B) 36
- C) 45
- D) 55

58%

2. A marathon cyclist travels around a route four times. The total distance travelled is 461.76 km. Let the distance of one lap around the route be d km. The equation that could be used in determining d is:

- A) $d + 461.76 = 4d$
- B) $2d = 461.76$
- C) $d = 4 \times 461.76$
- D) $4d = 461.76$

54%

3. Sixteen added to the product of three and a number is 31. An equation for this statement is:

- A) $3m - 16 = 31$
- B) $3m \times 16 = 31$
- C) $3m + 16 = 31$
- D) $3(16) + m = 31$

67%

4. The price of tennis balls is as follows:
- 1 tennis ball \$ 3.50
 - 2 tennis balls \$ 7.00
 - 3 tennis balls \$ 10.50

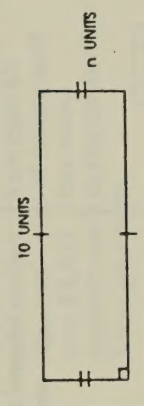
If n represents the number of tennis balls, which formula can be used to find the cost of any number of tennis balls?

- A) $3.50n$
- B) $3.50 + 3n$
- C) $3.50 + 2n$
- D) $3.50 + n$

54%

Some Students:

1. Examine the following rectangle.



The equation $2(n + 10) = 24$ tells that:

- A) the area of the rectangle is 24 square units.
- B) the length of the rectangle is 10 times its width.
- C) twice the length of the rectangle is 24 units.
- D) the perimeter of rectangle is 24 units.

%

2. The expression $(+3z) - (-z)$ equals:

- A) $4z$
- B) $2z$
- C) $3z^2$
- D) $4z^2$

%

3. Which of the following is equivalent to $ay + ay + ay$?

- A) ay^3
- B) $3ay$
- C) a^3y^3

%

4. When seven times a number n is increased by six the result is forty-one. Which of the following equations represents this relationship?
- A) $7n + 6 = 41$
 - B) $7n - 6 = 41$
 - C) $7n \times 6 = 41$
 - D) $7(n + 6) = 41$

%

Outcome T-4.2

STRAND 4: PATTERNING AND ALGEBRA

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Solve problems using linear equations in one variable.	All students will: - solve simple linear equations in one variable using concrete, informal and formal methods; - solve problems given the equation.	- solve simple problems using one of the following: table of values graphs formula. - create simple problems.
	In addition, most students will: create and solve linear equations for the purpose of problem solving in a variety of contexts.	- solve more complex problems using one of the following: table of values graphs formula. - create more complex problems.
	In addition, some students will: - generalize the process to solve any linear equation in one variable; - select linear equations when appropriate to solve problems in a variety of contexts.	- solve equations, other than linear, using a graph.

STRAND 4: PATTERNING AND ALGEBRA

Outcome T-4.2

All Students: 1. If $2 + \frac{n}{3} = 10$, then n equals A) 24 B) 28 C) 32 D) 36 2. If $2x + 4 = 10$, then what does x equal? Answer: _____ 68% 56%	Most Students: 1. Solve for n using an algebraic solution. $2n - 2 = -9n + 20$ 42% 2. $E = IR$ is an important formula in electricity. E represent the voltage in volts I represents the current in amperes R represents the resistance in ohms If E is 600 volts and R is 400 ohms, the current I is: A) 1 000 amperes B) 200 amperes C) 1.5 amperes D) 0.7 amperes 36%	Some Students: 1. Twice as many adults as students went to the school musical. Adult tickets cost \$7 and student tickets cost \$3. The total value of tickets sold was \$3,400. How many students went to the concert? Show your work. _____ %
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Outcome T-5.1

STRAND 5: DATA MANAGEMENT AND PROBABILITY

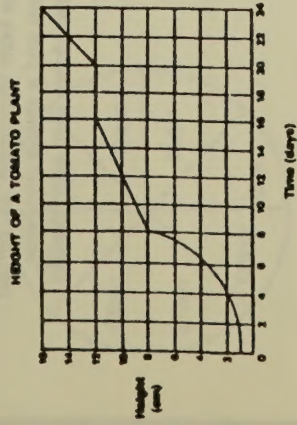
CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Collect, organize, describe and interpret data and make decisions based on the data.	All students will: systematically organize and describe a given set of data in order to answer questions about the data.	- organize a set of data using tally charts and frequency tables. - represent data by means of pictographs, bar graphs, broken line graphs, histograms and frequency curves. - select the appropriate graph for a given set of data. - interpolate from a given graph. - determine mean, median and mode for a given set of data. - appreciate the usefulness of statistical methods in decision making.
	In addition, most students will: for a given question, gather, organize, analyze and present data as evidence in answer to the question.	- represent data by circle graphs. - research, analyze and interpret data related to a given question, by using either primary sources (e.g. data gathered through a survey) or secondary sources (e.g. research in magazines, books, etc.). - interpret graphs to identify trends and patterns in the data, and pose and answer questions about the patterns and trends. - identify and compare primary data-gathering methods. - identify reasons for sampling and the characteristics of a good sample, including an investigation of randomness. - compare appropriateness of the mean, median and mode as measures of central tendency. - evaluate arguments that are based on data analysis. - make inferences that are based on data analysis.
	In addition, some students will: pose a question, investigate it, create a model, and make informed statements about the conclusion.	- identify a question of personal interest or one related to social issues. - establish a framework within which to investigate the issue, both at the school level and beyond. - use primary and secondary sources of data. - compare the results.

STRAND 5: DATA MANAGEMENT AND PROBABILITY

Outcome T-5.1

All Students:

1. The graph below shows the height of a tomato plant as measured over 24 days for a science project.

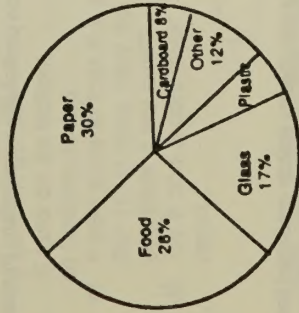


During which days did the tomato plant not grow?

- A) between the 2nd and the 8th day
B) between the 2nd and the 16th day
C) between the 20th and the 24th day
D) between the 16th and the 20th day

90%

2. At Chris' house 180 kg of garbage were created during a 3 month period. The graph below shows the types of garbage. What percentage of Chris' garbage was plastic?



Garbage Analysis

- A) 95%
B) 12%
C) 5%
D) 8%

91%

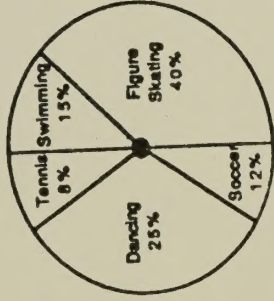
Most Students:

1. You need to select a representative sample of students in your high school to decide whether or not you should raise the student activity fee by \$5.00. Which of the following samples is the least biased?

- A) Every Grade 10 student in the school.
B) Every member of all sports teams of the school.
C) Every female student in the school.
D) Every 5th student from the school list.

61%

2. The circle graph shows how Marlina's time is spent on sports.



If she spends 1200 hours in one year on all sports, how many hours does she spend on figure skating?

- A) 7 200 hours
B) 480 hours
C) 48 000 hours
D) 1 200 hours
E) 4 800 hours

%

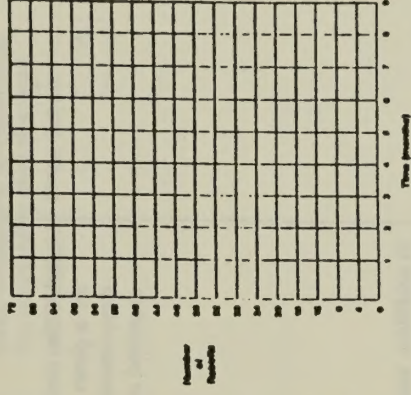
Some Students:

1. The table below shows the relation between the population in a rabbit colony and the length of time in months.

Time (in months)	0	1	2	3	4	5
Number of rabbits	2	4	6	8	10	12

Draw a graph of the relation on the grid below.

NUMBER OF RABBITS



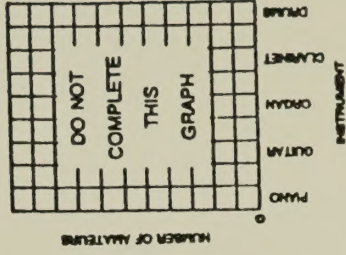
%

2. A list of the five most popular musical instruments played by amateurs is given below.

INSTRUMENT	NUMBER OF AMATEURS
Piano	18 000 000
Guitar	15 000 000
Organ	6 000 000
Clarinet	3 000 000
Drums	2 000 000

This data could be plotted on the grid below to make a bar graph.

Number of amateurs playing instruments



What is an appropriate scale for the above graph?

- A) 1 unit represents 1 000 000 amateurs
B) 1 unit represents 10 000 000 amateurs
C) 1 unit represents 2 000 000 amateurs
D) 1 unit represents 500 000 amateurs

%

Outcome T-5.2

STRAND 5: DATA MANAGEMENT AND PROBABILITY

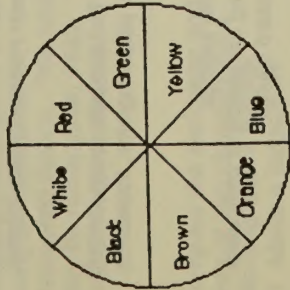
CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Investigate and apply the concepts of probability.	All students will: investigate the concept of probability through experimentation and simulation in a variety of contexts. In addition, most students will: for a given question, predict outcomes, perform probability experiments, and compare the results of actual experiments with expected or predicted results. In addition, some students will: pose a problem and then design, investigate, carry out and evaluate a probability experiment or simulation.	- carry out a probability experiment for which the instructions are provided. - list all possible outcomes of simple experiments. - identify the number of times specific outcomes occur and calculate the associated probabilities as fractions. - identify the range of probability values from 0 to 1 with the range from "impossible" to "certain". - recognize the connection between a simple probability experiment and a simple simulation. - predict future events based on probability calculations in examples drawn from everyday life. - explain why actual results do not always match predicted results. - identify the relationship between sample size and the accuracy of expected results. - demonstrate an understanding of probability as it affects personal life choices. - express probability values as fractions, decimals and percentages. - create a probability experiment or simulation to model a problem.

STRAND 5: DATA MANAGEMENT AND PROBABILITY

Outcome T-5.2

All Students:

1. A spinner has different colours as shown. What is the probability of spinning yellow?



3. a) Toss a paper cup 100 times. Record the number of times it lands on its top, its bottom, and its side.
b) From your results, state the probability that, when thrown, the cup will:
i) land on its side
ii) land on its bottom
iii) land on its top
c) If you were to toss the cup the 101st time, how do you think it will land?
d) Try it and record your result.

%

4. Think about things that might happen in a lifetime.
a) List 2 that are certain to happen to you.
b) List 2 that cannot happen to you.
c) List 2 that are highly likely to happen to you.
d) List 2 that are very unlikely to happen to you.

%

2. The table below gives a record of Emma's last 100 at-bats for her

Home-Runs	15
Triples	3
Doubles	12
Singles	21
Walks	12
Outs	37
TOTALS	100

What is the probability that

Emma will:

- a) hit a home-run?
b) walk?
c) get a hit?

%

Most Students:

1. a) When rolling two number cubes, what is the probability that a "9" will come up?
b) By considering all possible outcomes, predict the probability.
c) Carry out an experiment to test your prediction. Describe the experiment and your results.
d) Compare your predicted and experimental probabilities. Discuss.

%

2. Records for a city indicate that it has snowed on April 2 to 28 out of the last 50 years. Today is April 1. Should you wear your boots tomorrow? Explain.

%

3. Based on ten years of accumulated data, a high school teacher states that the probability of passing a particular course is 0.875. You are taking the course and are in a class of 34 students. Discuss the probability figure as it affects your class and you.

%

Some Students:

1. Simulate the birth of four children in a family to determine the probability that there will be 3 boys and 1 girl. Explain the process you used and make a clear conclusion.

%

2. At a particular intersection, a traffic light is green for 35 seconds, yellow for 3 seconds, and red for 22 seconds. Simulate the arrival of a car at this intersection on three occasions to determine the probability that the light will be red all three times.

%

Outcome T-6.1

STRAND 6: ESTIMATION AND MEASUREMENT

CRITICAL LEARNING OUTCOMES	BENCHMARKS	SAMPLE EVIDENCE
Investigate, develop and apply procedures to measure a variety of shapes and solids using concrete materials and appropriate units.	All students will: • using appropriate units, estimate, measure, and calculate the perimeter and area of shapes bounded by straight lines and the volume of rectangular prisms; • construct and interpret scale diagrams; • use a variety of procedures to solve simple problems involving measurement.	- relate the purpose and process of measurement to counting of units. - recognize that measurement is used in a wide variety of situations. - recognize that standard measurements are used in real-life situations (e.g. height of a table, width of a doorway, clothing sizes). - understand what is measured by each of the following components: linear measure, area, volume, capacity, mass, temperature, time. - recognize whether an exact measure or an estimate is appropriate. - select and use the most appropriate measurement devices and units to find accurate measurements. - estimate and determine the perimeter and area of rectangles, triangles, parallelograms, trapezoids. - construct and interpret scale diagrams. - estimate and determine the volume of rectangular prisms. - recognize and apply the knowledge and skills of measurement in real-life settings. - use a variety of strategies to solve simple measurement problems, using calculators or computers. - determine the area of a complex figure that can be sub-divided to standard figures.
	In addition, most students will: • estimate, measure and calculate the perimeter and area of circles and irregular shapes, the volume and surface area of prisms and cylinders; • use a variety of procedures to solve problems involving measurement. In addition, some students will: • make generalizations about perimeter, area and volume in order to generate formulas; • solve complex problems involving measurement.	- understand and appreciate the approximate nature of all measurements. - demonstrate an understanding of the value of pi. - estimate and determine the circumference and area of circles and irregular shapes. - estimate and determine the volume and surface area of rectangular prisms and cylinders. - pose and solve measurement problems using a variety of strategies, and incorporating the use of calculators and computers. - make a generalization that if one measurement of an object is constant, the others may vary (e.g. a variety of perimeters are possible for a rectangle with an area of 20 square units). - solve problems requiring the identification of the largest or smallest area for a given perimeter. - demonstrate an understanding of the effect on volume of varying the dimensions of an object. - solve complex problems involving measurement. - investigate measurement units used throughout history.

• additional outcomes relating to temperature, time, distance and money will be achieved in Science, Geography, History, Distance, Family Studies, Business Education and Technological Studies.

STRAND 6: ESTIMATION AND MEASUREMENT

Outcome T-6.1

All Students:

1. Investigate the reasoning behind shoe sizing. %
2. Measure the length of a table using an appropriate measuring device. The table may be rectangular, oval, circular, trapezoidal, etc. %
3. Compare the perimeter and area of two chosen rooms. Working with a partner:
- a) Make a judgement concerning which room has the greater perimeter and which has the greater area.
- b) For each room:
- estimate the dimensions of the room
 - use a formula to calculate estimated perimeter and area
 - test the estimation through measurement of dimensions and recalculation of perimeter and area
 - construct a scale diagram for each room
- c) Compare the original judgement to the results of the estimated values and the measured values.
- d) Prepare a written report of the investigation and the results. %

4. Name a unit in which each of the following would be measured: potato chips, toothpaste, soda pop, an adult's height, a person's mass, milk, temperature, butter, gasoline, cereal, bread, the distance from Toronto to St. Catharines, top soil, prescription medication, water consumption in your home, electricity, air pollution, carpeting, precipitation. %

5. The volume of the Biffo Cereal box is:



- A) 6 048.24 cm³
B) 695.2 cm³
C) 274.92 cm³
D) 62.3 cm³

71%

Most Students:

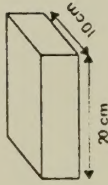
1. Working collaboratively in a group: Measure the circumferences and diameters of a variety of circular objects. For each object, calculate the ratio of circumference to diameter. Examine the resulting ratios. Compare your results with another group. Make a conclusion. %

2. A circular pizza has a diameter 45 cm. The tomato sauce on it forms a circle in the centre having a radius of 20 cm. What is the area of the uncovered crust? %

3. Circular patio stones are going to be placed in a garden to provide a walkway across it. The total length of the walkway will be 7.3 m. The diameter of one patio stone is 45 cm. How far apart should the patio stones be placed to complete the walkway and to enable a typical person to walk comfortably from one stone to the next? %

4. A juice box tetrapak measures 10 cm x 6 cm x 3 cm. Calculate the total surface area of the juice box. %

5. The volume of a block is 600 cm³. Find the height of the block.



- A) 3 cm
B) 20 cm
C) 30 cm
D) 6 cm

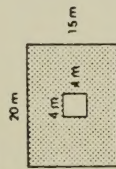
60%

6. On December 15 the temperature inside a science laboratory was 21°C. The temperature outside was -6°C. The science laboratory was warmer than the outside temperature by:

- A) -15°C
B) 15°C
C) 27°C
D) -27°C

59%

7. A square is removed from the rectangle as shown below.



What is the area of the remaining part?

- A) 316 m²
B) 300 m²
C) 284 m²
D) 80 m²
E) 16 m²

63%

Some Students:

1. a) A farmer's field is bounded on one side by a river. The farmer has 200 m of wire to make a fence. What are the dimensions of the rectangle of largest area that the farmer may fence in with the wire available?
b) Suppose the farmer has 300m of wire available. What are the dimensions of the rectangle of largest area? What about 180 m of wire?
c) Make a generalization for the dimensions of the rectangle of largest area given that x m of wire are available.
d) Is the rectangle the best shape to use? Explain your answer. %

2. a) Paper towel is sold in packages of two rolls. Each roll is a cylinder having a height of 30 cm and an outer diameter of 12 cm. Design a shipping carton that will contain 12 packages.
b) The inner diameter of each roll is 4 cm. How much waste space is there in the carton? %

3. The dimensions of a triangular prism are shown in the diagram below.



What is the surface area of this triangular prism?

- A) 120 cm²
B) 108 cm²
C) 96 cm²
D) 76 cm²

22%

APPENDICES

- I.(a) Definition of Provincial Benchmarks**
- (b) Framework for the Development of Provincial Benchmarks**

- II. Critical Learning Outcomes**
 - (a) by Grade**
 - (b) by Strand**

PROVINCIAL BENCHMARKS

WHAT ARE THEY?

- Provincial Benchmarks are broad standards for the province against which to assess students' learning. They set worthwhile goals for all, by describing expected *provincial* levels of achievement. Their primary focus is to make a clear statement to teachers, parents and students about expected results. The current provincial mathematics benchmarks indicate provincial standards for the end of each division (grades 3, 6, and 9).

HOW WILL THEY BE USED?

- Provincial benchmarks (standards) will provide a concrete framework for both student and program assessment.
- Provincial benchmarks will act as references for teachers when assessing individual students and reporting to parents.
- Provincial benchmarks will provide information for parents and guardians about what they can expect their students to be learning.
- Provincial benchmarks will provide a concrete basis for school boards to develop board-wide assessments.
- Provincial benchmarks will also be used to inform the auditing of province-wide student achievement.

Since they are *provincial* standards, they will need to be used with care and in context with individuals, schools and communities.

DEFINING THE CURRICULUM		
Mathematics Strands	Critical Learning Outcomes	
What are the major areas of concentration within the mathematics program? 1. Inquiry and Problem Solving 2. Number Sense and Numeration 3. Spatial Sense and Geometry 4. Patterning and Algebra 5. Data Management and Probability 6. Estimation and Measurement	What are mathematics students expected to know, be able to do, and be like?	
Curriculum Policy and Restructuring		

STATING THE PROVINCIAL STANDARDS	
Benchmarks	Sample Evidence
What provincial standards of achievement are expected for these critical learning outcomes?	What would indicate that students have achieved the provincial standards?
Benchmarks	

CHECKING AGAINST THE PROVINCIAL STANDARDS	
Sample Assessment Activities	Sample Assessment Methods
What will the items, questions or tasks look like that are used to check against the benchmarks?	What techniques may be used to collect data about provincial achievement? • portfolios/samples • journals • multiple choice • teacher anecdotal/observations • paper and pencil • video/audio • construction/models • demonstration (film strip/overhead) • retell/explain • role play • project • applications - creating problems • create games and other activities • oral presentation • inventing • experimenting • student profile sheet • self evaluation • peer evaluation • problem-solving rubrics • story writing • pictures/art work • problem posing • graphs and charts • collaborative and co-operative activities • computers • concrete materials • calculator • models • conferencing • interviews • research • mental calculation • surveys
Provincial Reviews	

**MATHEMATICS OUTCOMES
(BY GRADE)**

GRADE 3

Demonstrate their ability to recognize, create and solve problems by applying thinking and communication skills: (P.1.1)

Demonstrate understanding of our numeration system. (P.2.1)

Understand the fundamental operations of addition, subtraction, multiplication and division and their inter-relationships. (P.2.2)

Develop a spatial sense for their own environment, the properties of the objects in it and their interrelationships. (P.3.1)

Demonstrate understanding of the attributes of two dimensional figures and three dimensional shapes and their properties as they move in space. (P.3.2)

Recognize, describe and generalize patterns to build mathematical models and to solve everyday problems. (P.4.1)

Collect, organize, display and interpret data and investigate the concepts of chance and probability. (P.5.1)

Demonstrate understanding of the concepts of temperature, time, distance, area, capacity/volume, mass and money, and where applicable, estimate, measure and interrelate them. (P.6.1)

GRADE 6

Pose and solve everyday problems including those from their own experiences and from classroom activities using a wide variety of strategies and evaluate and justify the conclusions. (J.1.1)

Identify and understand whole number place values, decimal place values and demonstrate an ability to estimate, read and write numbers. (J.2.1)

Select and use an appropriate method of computation from among estimation, mental, paper and pencil, calculator, computers, and/or manipulative materials, and solve a problem accurately that involves computation using whole numbers, fractions and decimals. (J.2.2)

Use motion geometry to verify the basic properties of figures and to recognize and create patterns and designs. (J.3.1)

Describe, model, draw, classify, and compare two-dimensional and three-dimensional figures and explain their properties. (J.3.2)

Identify and describe patterns and functions in several ways, and explore the relationships among them. (J.4.1)

Collect, organize, display and interpret data, integrating the concepts of chance and probability through investigation and application. (J.5.1)

Estimate, measure and record temperature, length, area, capacity, volume, mass, money and time using appropriate units. (J.6.1)

GRADE 9

Using a variety of strategies, pose and solve a wide range of everyday problems from their own experiences and across subject areas. (T.1.1)

Use computational estimation and mental calculation to judge the validity or reasonableness of answers in a variety of contexts. (T.2.1)

Demonstrate in context, with or without the use of a calculator, a thorough knowledge of arithmetic facts and accurate computational and mental calculation skills involving whole numbers, decimals, fractions, percent, integers, ratio and rate, powers and square root. (T.2.2)

Demonstrate spatial sense and understanding of geometric relationships by investigating two dimensional, three dimensional, and transformational geometry. (T.3.1)

Use coordinate geometry to describe and represent relationships defined by tables, graphs, and equations or formulas. (T.3.2)

Represent mathematics symbolically. (T.4.1)

Solve problems using linear equations in one variable. (T.4.2)

Collect, organize, describe and interpret data and make decisions based on the data. (T.5.1)

Investigate and apply the concepts of probability. (T.5.2)

Investigate, develop and apply procedures to measure a variety of shapes and solids using concrete materials and appropriate units. (T.6.1)

MATHEMATICS OUTCOMES (BY STRAND)

1. INQUIRY AND PROBLEM SOLVING

Demonstrate their ability to recognize, create and solve problems by applying thinking and communication skills. (Grade 3, P.1.1)

Pose and solve everyday problems including those from their own experiences and from classroom activities using a wide variety of strategies and evaluate and justify the conclusions. (Grade 6, J.1.1)

Using a variety of strategies, pose and solve a wide range of everyday problems from their own experiences and across subject areas. (Grade 9, T.1.1)

2. NUMBER SENSE AND NUMERATION

Demonstrate understanding of our numeration system. (Grade 3, P.2.1)

Understand the fundamental operations of addition, subtraction, multiplication and division and their inter-relationships. (Grade 3, P.2.2)

Identify and understand whole number place values, decimal place values and demonstrate an ability to estimate, read and write numbers. (Grade 6, J.2.1)

Select and use an appropriate method of computation from among estimation, mental, paper and pencil, calculator, computers, and/or manipulative materials, and solve a problem accurately that involves computation using whole numbers, fractions and decimals. (Grade 6, J.2.2)

Use computational estimation and mental calculation to judge the validity or reasonableness of answers in a variety of contexts. (Grade 9, T.2.1)

Demonstrate in context, with or without the use of a calculator, a thorough knowledge of arithmetic facts and accurate computational and mental calculation skills, involving whole numbers, decimals, fractions, percent, integers, ratio and rate, powers and square root. (Grade 9, T.2.2)

3. SPATIAL SENSE AND GEOMETRY

Develop a spatial sense for their own environment, the properties of the objects in it and their interrelationships. (Grade 3, P.3.1)

Demonstrate understanding of the attributes of two dimensional figures and three dimensional shapes and their properties as they move in space. (Grade 3, P.3.2)

Describe, model, draw, classify, and compare two-dimensional and three-dimensional figures and explain their properties. (Grade 6, J.3.1)

Use motion geometry to verify the basic properties of figures and to recognize and create patterns and designs. (Grade 6, J.3.2)

Demonstrate spatial sense and understanding of geometric relationships by investigating two dimensional, three dimensional, and transformational geometry. (Grade 9, T.3.1)

Use coordinate geometry to describe and represent relationships defined by tables, graphs, and equations or formulas. (Grade 9, T.3.2)

4. PATTERNING AND ALGEBRA

Recognize, describe and generalize patterns to build mathematical models and to solve everyday problems. (Grade 3, P.4.1)

Identify and describe patterns and functions in several ways, and explore the relationships among them. (Grade 6, J.4.1)

Represent mathematics symbolically. (Grade 9, T.4.1)

Solve problems using linear equations in one variable. (Grade 9, T.4.2)

5. DATA MANAGEMENT AND PROBABILITY

Collect, organize, display and interpret data and investigate the concepts of chance and probability. (Grade 3, P.5.1)

Collect, organize, display and interpret data, integrating the concepts of chance and probability through investigation and application. (Grade 6, J.5.1)

Collect, organize, describe and interpret data and make decisions based on the data. (Grade 9, T.5.1)

Investigate and apply the concepts of probability. (Grade 9, T.5.2)

6. ESTIMATION AND MEASUREMENT

Demonstrate understanding of the concepts of temperature, time, distance, area, capacity/volume, mass and money, and where applicable, estimate, measure and interrelate them. (Grade 3, P.6.1)

Estimate, measure and record temperature, length, area, capacity, volume, mass, money and time using appropriate units. (Grade 6, J.6.1)

Investigate, develop and apply procedures to measure a variety of shapes and solids using concrete materials and appropriate units. (Grade 9, T.6.1)

Please submit initial questions or suggestions to your Regional Office of the Ministry of Education:

Central Ontario Region
Suite 3201

2025 Sheppard Avenue East
North York, Ontario
M2J 1W4

Northeastern Ontario Region
P.O. Box 3020

447 McKeown Avenue
North Bay, Ontario
P1B 8K7

Eastern Ontario Region
4th Floor, 1580 Merivale Road
Nepean, Ontario
K2G 4B5

Midnorthern Ontario Region
7th Floor, 199 Larch Street
Sudbury, Ontario
P3E 5P9

Northwestern Ontario Region
1st Floor, Ontario Government Bldg.
P.O. Box 5000, 435 James Street South
Thunder Bay, Ontario

Western Ontario Region
759 Hyde Park Road
London, Ontario
N6H 3S6

or to the Provincial Benchmarks Project:

Gail Rappolt
Field Co-ordinator
Provincial Benchmarks Project
Ministry of Education
Learning Assessment Branch
18th Floor, 900 Bay Street
Toronto, Ontario
M7A 1L2

Gérald Hurtubise
French Language Co-ordinator
Provincial Benchmarks Project
Eastern Ontario Region
4th Floor, 1580 Merivale Road
Nepean, Ontario
K2G 4B5

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